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Studies in Australian Pteridophytes. No. 1

Mary D. Tindale, M.Sc.

During the two years which I recently spent abroad mainly at the Herbarium of the Royal Botanic Gardens, Kew, England, I was privileged to see the types of many Australian pteridophytes. The results of some of my studies there are set forth in this paper.

The following abbreviations for herbaria are used in the citation of specimens which have been examined:—

KEW, The Herbarium, Royal Botanic Gardens, Kew.
BM., British Museum of Natural History, South Kensington, England.
P., Natural History Museum, Paris.
VIENNA, Natural History Museum, Vienna.
NSW., National Herbarium, Sydney, New South Wales.
MEL., National Herbarium, Melbourne, Victoria.
BRI., Botanic Museum and Herbarium, Brisbane, Queensland.
SYD., Department of Botany, University of Sydney.
AD., Department of Botany, University of Adelaide.

Athyrium assimile.

Athyrium assimile (*Endl.*) *Presl,* Tent. Pterid., (1836), 98.

Absolute Synonyms: *Asplenium assimile* Endl., Prodr. Fl. Norf., (1833), 10. Holotype: Insula Norfolk, Ferd. Bauer (VIENNA, v.), consisting of a fertile frond, but the rhizome is absent; *Athyrium umbrosum* (Ait.) Presl. var. *assimile* (Endl.) Maiden, in Proc. Linn. Soc. N.S.W., XXVIII, 1903 (1904), 735, based on *Asplenium assimile* Endl. Hooker and Baker in their Synopsis Filicum, (1874), 489, referred to *Asplenium assimile* as a variety of *Asplenium umbrosum* but did not make the actual combination, although Maiden attributed it to them. The holotype is figured on Plate II.

Equivalent Synonyms: *Asplenium umbrosum* (Ait.) J. Sm. var. *tenerum*[1] F. M. Bail. (partim), Fern World Austr., (1881), 56; F. M. Bail., Syn. Queensl. Fl., (1883), 708; F. M. Bail., Lith. Ferns Queensl., (1892), 115. Typification: In his Fern World of Australia F. M. Bailey did not cite a type specimen but mentioned two localities, namely "near Brisbane, plentiful in the Maroochie scrubs." In the Botanic Museum and Herbarium, Brisbane, there is a specimen collected at Maroochie by F. M. Bailey in July, 1879, labelled *Asplenium umbrosum* var. *tenerum* by Bailey. This appears to be a depauperate specimen of *Athyrium australe* (R. Br.) Pr. The spores are much larger than in any specimen of *A. assimile* which I have examined, and are identical with those of *A. australe,* i.e., they are 22.5-32 μ x 37.5-56 μ (polar diameter by largest equatorial diameter) with a wing 4-15 μ broad[2]. Mr. L. S. Smith, of the latter herbarium, has informed me that there was another specimen in the same type folder. He has suggested that it was very probably collected near Brisbane, i.e. the other type locality mentioned by Bailey. Certainly this specimen is a much better match for the illustration in Bailey's Lith. Ferns Queensl., l.c. 115, and is identical with *A. assimile*. The spores of this specimen vary from 17-19 μ x 26-30 μ with a wing about 2 μ broad, as in the latter species. *Athyrium umbrosum* (Ait.) Presl.[3] var. *tenerum* (F.M. Bail.) Domin (partim), in Bibl. Bot., LXXXV (1914?), 86, based on *Asplenium umbrosum* var. *tenerum* F. M. Bail.

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[1] Published as *tenera,* an orthographical error.

[2] The spores were boiled in a 10% solution of KOH for two minutes and mounted in glycerin before measurements were taken.

Rhizome erect or shortly creeping, black, up to 4 cm. broad, densely covered with the bases of the old stipes; clothed with black or dark brown scales which are lighter brown towards the margins, lustrous, acuminate, entire, mostly lanceolate (3:1), thick or papery, 6 to 8 mm. long and 1.5 to 3 mm. broad. *Stipes* deeply 3-sulcate above, yellow, light brown, blue-grey or blackish-blue, black at the base, smooth or slightly muricate, 1 to 3.5 mm. in diam. towards the middle, clothed at the base with the same type of scales as on the rhizome, glabrous towards the middle and apex except for a few, scattered, fawn, papery, clathrate, narrow lanceolate to ovate or rounded scales. *Main rhachis* zig-zagged between the primary pinnae. *Lamina* 25 to 55 cm. in length, 15 to 40 cm. in breadth, very membranous, flaccid, 3-pinnate to 3-pinnate-pinnatifid, bright green, darker on the upper surface. *Tertiary segments* 3 to 13 mm. (usually 5 to 9 mm.) long, 1.5 to 8 mm. (usually 3 to 5 mm.) broad, narrow oblong (3:1) to broadly oblong (3:2), ovate-oblong (3:2) to broadly ovate-oblong (6:5), frequently obliquely rhomboidal; apex obtuse (often bluntly), broadly rounded or truncate, apical teeth erose, lobed from ⅓ to ⅔ of the way to the costule. *Secondary rhachises* black or blue-black at the junction with the primary rhachis. *Costae* glabrous except for a few, clathrate, acuminate, ovate to broadly ovate scales with dark red cell-walls and a few marginal processes (or sometimes entire). *Veins* free, rather prominent, 3 to 6 pairs in the tertiary segments, glabrous except for a few unbranched hairs each consisting of a single row of cells. *Sori* indusiate, superficial, very numerous, borne on the lower portion of the minor veinlet or its uppermost branch. *Indusium* membranous, entire or slightly erose, 1 to 3 mm. long, up to 0.5 mm. broad; brown or orange-brown, darker towards the point of attachment to the veinlet, sometimes diplazioid but mostly single. *Spores* bilateral, oblong-reniform, perispore winged, surface crested; mostly 15-30 μ x 24-39 μ (polar diam. by the largest equatorial diam.), the wing usually 2-7.5 μ broad.[4]

Distribution: Australia (New South Wales and Queensland) and Norfolk Island. This species is also recorded from New Guinea by Carl Christensen in the Index Filicum, Suppl., (1913), 97, but I have seen no authentic specimens from that country.

Norfolk Island: In shaded woods, A. Cunningham No. 30-31, 55/N. Isld., 1830 (KEW); woods, high ground, Milne, H.M.S. "Herald," 6.1855 (KEW); C. J. Simmons, 10-12.1849 (KEW); A. S. Churchill, 1854 (KEW); Paterson (BM.); forest, W. Fasken No. 127, 24-31.8.1862 (BM.); Metcalfe, 2.1905 (NSW. P4956); I. Robinson, 1902 (NSW. P5016); Maiden and Boorman, 11.1902 (NSW. P4958).

Australia, New South Wales: Mt. Lindsay, alt. 3,100 ft., growing under cliffs, rocky ground, mountain slopes, conglomerate, E.F. Constable, 26.5.1949 (NSW. P6218; BM.); Mt. Lindsay, J. L. Boorman, 3.1916 (NSW. P999); Mt. Lindsay, border of N.S.W. and Queensland, C. T. White, 10.1921 (NSW. P3305); Cape Byron, C. Moore, received 5.1867 (KEW); Tumbulgum, near Murwillumbah, W. Bauerlen, 4.1898 (NSW. P3323); Cooper's Creek, near Mullumbimby, D. A. Goy No. 141, 26.8.1936 (BRI.; BM.); Tintenbar, W. W. Watts, 1901 (NSW. P632); Richmond River, W. W. Watts, 1901 (NSW. P623 and P654); Dorrigo, W. Heron, 6.1910 (NSW. P3338); Bulgong Heights, W. W. Watts, 5.1916 (NSW. P646); Dyer's Crossing, Nabiac, in rain forest, L. Gilbert, 20.7.1946 (NSW. P564).

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[3] *Athyrium umbrosum* (Ait.) Presl is confined to the Atlantic Islands, whereas *A. australe* (R. Br.) Presl occurs in Australia, New Zealand and New Caledonia; see Carl Christensen, Index Filicum, Suppl. 3 (1934), 40, 44.

[4] The spores were boiled in a 10% solution of KOH for two minutes and mounted in glycerin before measurements were taken in the following specimens:—NSW. Nos. P999, P564, P632, P3323, P4958, P5016, and the type collection of *Asplenium umbrosum* var. *tenerum*.

Queensland: Mt. Bauple, Wide Bay district, C. T. White, 21.6.1927 (BRI.); Kin Kin, C. T. White, 1.1917 (BRI.; NSW. P3331); Yandina, S.E. Queensland, J. H. Simmonds, 3.1891 (BRI.); Numinbah Valley, D. A. Goy and L. S. Smith No. 531, 8.10.1938 (BRI.); Moran's Creek, Lamington National Park, alt. 2,000 ft., D. A. Goy and L. S. Smith, No. 181, 16.1.1938 (BRI.; BM.); ditto, alt. about 1,500 ft., around creek at foot of falls, Goy and Smith, No. 106, 10.1.1938 (BRI.; BM.); Spring Creek Plateau, S.E. Queensland, 2,800 ft. alt., Goy and Smith, No. 353, 1.5.1938 (BRI.).

Athyrium assimile is omitted from Bentham's Fl. Austr., VII (1878), Moore and Betche's Handb. Fl. N.S.W. (1893), Maiden and Betche's Census of N.S.W. Pl., (1916) and Melvaine's Check List of N.S.W. Pter. in Proc. Linn. Soc. N.S.W., LXI, 3-4 (1936), 118. In New South Wales this species occurs in the rain forests of the coastal mountain ranges but it has not been recorded south of Nabiac, near Taree, in the Manning River district. My thanks are due to Mr. L. Gilbert, who collected some fine specimens of this fern complete with the rhizomes, in the latter locality.

A. assimile has bright green, membranous fronds and an erect or shortly creeping rhizome. It is very closely allied to *A. australe* (R. Br.) Presl (i.e., *Athyrium umbrosum* auctt., of Maiden and Betche, Ewart and Melvaine, non (Ait.) Presl, and *Asplenium umbrosum* auctt., of F. Muell., Bentham, Moore and Betche, non (Ait.) J. Sm.) but differs from the latter principally in the size of the tertiary laminal segments which are smaller in *A. assimile,* i.e., 3 to 13 mm. (usually 5 to 9 mm.) long and 1.5 to 8 mm. (usually 3 to 5 mm.) broad, while they are 5 to 25 mm. (usually 8 to 12 mm.) long and 2 to 10 mm. (usually 4 to 6 mm.) broad in *A. australe.* The ultimate segments in *A. assimile* are usually more broadly rounded at the apex, also in this species there is a very noticeable, black or blue-black mark at the junction of each secondary rhachis with the main rhachis, whereas in *A. australe* these bases vary from yellow or light brown to more uncommonly dark brown or black. The most important difference between the two species lies in the scales of the rhizomes which are always lustrous over the whole surface in *A. assimile,* but are dull or rarely metallic towards the centre in *A. australe.* The spores are also of different sizes, although they are alike in shape, i.e., bilateral and reniform-oblong. In *A. assimile* the spores are 15-30 μ x 24-39 μ (i.e., polar diameter by largest equatorial diameter), surrounded by a perispore with a few, sinuous crests and a wing from 2 to 7.5 μ broad which is usually dissected into a few lobes. The spores of *A. australe*[5] are of a similar type but are much larger, i.e., they are 21-37.5 μ x 34-60 μ, the wing being 3.75-15 μ broad.

In Bibl. Bot., LXXXV (1914?), 87, Domin queried whether *Allantodia tenera* R. Br., Prodr. Fl. N. Holl., (1810), 149, was synonymous with *Athyrium umbrosum* (Ait.) Pr. var. *tenerum* (F. M. Bail.) Domin (i.e., *Athyrium assimile* (Endl.) Pr.). When I was in England, I took the opportunity of comparing the types of *Allantodia tenera* and *Athyrium assimile* and found that they are not identical. *Allantodia tenera* is a form of *Athyrium australe* with narrow tertiary laminal segments. The type of *A. tenera* which is in the British Museum of Natural History, South Kensington, is labelled as follows in Robert Brown's own handwriting:—"Nova Cambria australis, Port Jackson, R. Brown, *Allantodia tenera.*" There are also two sheets at Kew Herbarium labelled "Paterson's River, R. Brown, No. 24, Iter Austral., 1802-05" but not in Brown's writing.

Another closely related species is *Athyrium cognatum* (Mett.) Hieron., of Ceylon, to which *A. assimile* bears a strong resemblance. G. Hieronymus, in Hedwigia, LIX, 1917, (1918), 321, differentiated between these two species, the main point of difference being that the spores of *A. cognatum* are covered with conical protuberances. He also cited a specimen of *A. assimile* collected by L. Leichhardt in 1842 in Australia, but his paper appears to have been overlooked by subsequent botanists working on the Australian flora.

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[5] The spores were treated as in *A. assimile.* An average of five spores was examined in each of the following specimens:—NSW. Nos. P988, P989, P979, P649, P626 and P5965.

The Identity of Hemitelia australis.

The identity of the tree fern described as *Hemitelia australis* by C. B. Presl in his Epimeliae Botanicae, (1849), 33, has long been a matter of conjecture amongst Australian botanists. T. Moore in his Index Filicum, II (1857), 59, transferred it to *Amphicosmia* and Domin based his new name *Cyathea australiensis* on it, when he transferred most of the then-known species of *Hemitelia* and *Alsophila* to *Cyathea* in Pteridophyta (1929), 263. A new epithet was necessary because the combination *Cyathea australis* (R. Br.) Domin, based on *Alsophila australis* R. Br. (1810), a different species, was already published. *Hemitelia australis* was listed as a good species by Carl Christensen in his Index Filicum, (1905), 347, and later in the Third Supplement (1934), 110.

By the courtesy of Dr. K. H. Rechinger and Mr. A. H. G. Alston, I was able to examine the holotype of *Hemitelia australis* from the Natural History Museum, Vienna. This specimen is identical with *Cyathea leichhardtiana* (F. Muell.) Copel.[6], by which name this species must now be known. It has only been recorded from Australia, where it is found in the rain forests of Queensland, New South Wales and Victoria. The type of *H. australis* is labelled "arbor, Australasia, Hügel," the determination being in Presl's own handwriting (see plate I). This specimen consists of two fertile primary pinnae still attached to a portion of the main rhachis which is dark reddish-purple and is furnished with straight or curved spines. The base of the stipe is missing but there is no doubt about the identity of the species, as the indusium and costal scales are typical of *Cyathea leichhardtiana*. The indusium is silky, membranous, whitish or very pale fawn and is soon broken into fragments. The margin of the indusium has fine, white fimbriae or atropurpureous spinules. The scales on the lower surface of the costae are atropurpureous or yellowish with numerous, purplish, marginal spinules, but a number of tawny squamules also occur amongst these paleae.

Lycopodium deuterodensum.

I would like to draw attention to the name change of one of Australia's commonest lycopods, as Herter's "Index Lycopodiorum" (1949), is unavailable in many libraries here. *Lycopodium deuterodensum* Herter, Ind. Lycopod., (1949), 15, replaces *L. densum* Labill., Nov. Holl. Pl. Sp., II (1806), 104, t. 251, f. 1, since the latter is a later homonym of *L. densum* Lam., Fl. Franc., I (1778), 33. Because Herter based his new name directly on *L. densum* Labill., the types of these two names are identical. This holotype is located in the Botanical Institute of the University of Florence, Italy, where I was able to examine it through the courtesy of Dr. R. Pichi-Sermolli. It is labelled "Terra Diemen,[7] Herb. Webbianum, ex Herb. Labillardière" but not in the author's own handwriting, although Labillardière's original description in his hand is affixed to the sheet. The specimen figured by him appears to be more bushy than the type.

L. deuterodensum ranges from Australia and New Zealand to New Caledonia. In Australia it occurs mainly in the dividing range and coastal regions of Queensland, New South Wales, Victoria, South Australia and Tasmania. It is comparatively common in sheltered positions close to rain forest, especially at high altitudes in the Blue Mountains and the Monga-Braidwood district of New South Wales.

Marsilea mutica.

Marsilea mutica *Mett.*, Ann. Sci. Nat., Sér. 4, XV (1861), 88.

Holotype: Lieux inondé à Kanala, New Caledonia, Vieillard No. 1698, 1855-60 (P.), (v.), also 2 isotypes (P.).

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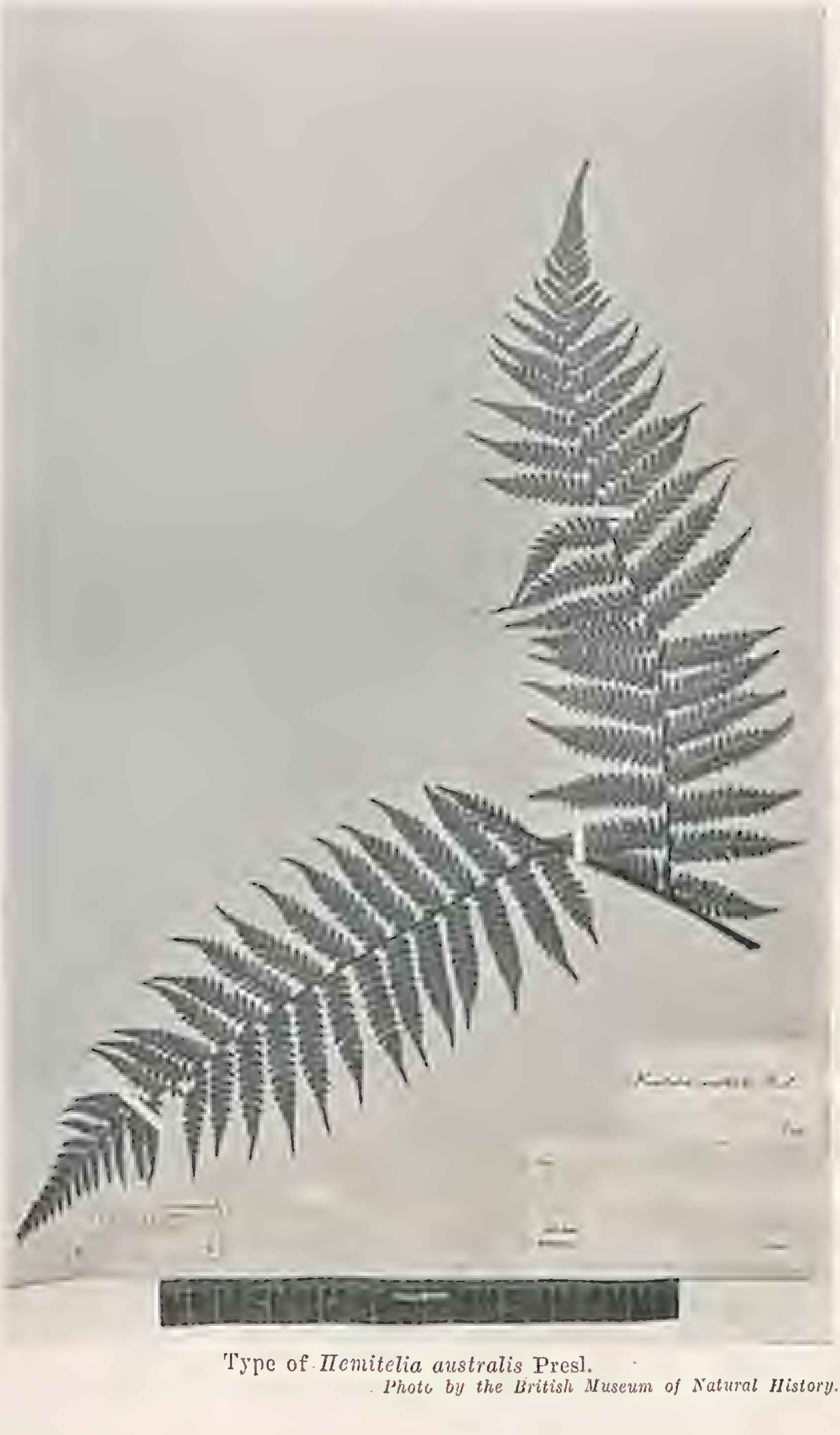
[6] Based on *Alsophila leichhardtiana* F. Muell., Fragm., V (1865), 53.

[7] i.e. Tasmania.

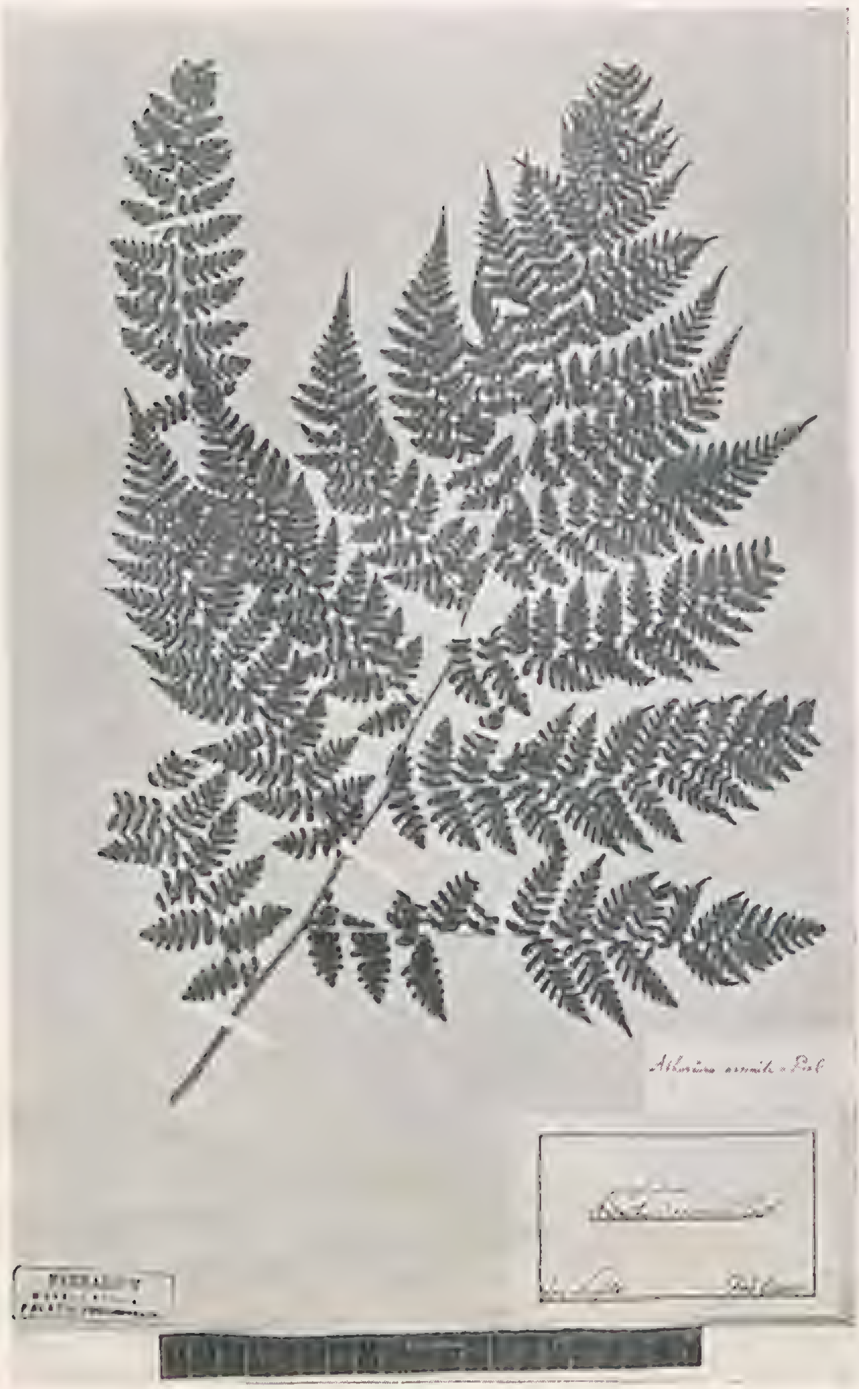
PLATE I.



Type of *Hemitelia australis* Presl.

Photo by the British Museum of Natural History.

Plate II.



Type of *Asplenium assimile* Endl.
Photo by the British Museum of Natural History.

EQUIVALENT SYNONYM: *Marsilea brownii* A. Br., Monatsberichte der Königlichen Preuss. Akademie der Wissenschaften zu Berlin, 1863, (1864), 418. HOLOTYPE: Port Jackson, Australia, R. Brown No. 137 (BM.), (v.), isotype (KEW). Later in the same periodical of 1870, 725, A. Braun stated that the original specimens (i.e., the type) were in the British Museum, but he also cited a specimen which is now in the National Herbarium, Melbourne, namely "Lagoons near Richmond, forma aquatica foliis natantibus subtus striatis cellulis epidermis planis, C. Wilhelmi."

R. Brown in Prodr. Fl. N. Holl., (1810), 167, incorrectly referred his specimens of this species collected in the Port Jackson district to *Marsilea quadrifolia L.*

Rhizome long-creeping, branched, often woody, light red, light brown, red-brown or black, 1 to 2.5 mm. in diam., glabrous except for a few fawn hairs at the nodes which bear adventitious roots. *Sterile fronds* solitary, borne at intervals along the rhizome, young sterile leaves circinnate. *Floating Forms:—Stipes* up to 1 m. or more in length, 0.8 to 2 mm. broad, rather flattened, green, yellow or light brown with a brown or green central strand, glabrous, dilated towards the apex. *Sterile lamina* 4-lobed, green or brownish with a yellowish patch near the base of each leaflet, thin, sub-membranous to herbaceous, usually 4.5 to 8.5 cm. in diam., glabrous on both surfaces. *Leaflets* contracted near the base, broadly obovate-cuneate (6:5) to very broadly obovate-cuneate (6:6), 2.4 to 4.2 cm. long and 2.3 to 4.3 cm. broad, apex very broadly rounded, margin entire or almost so; veins fine, very numerous, radiating from the base of the leaflet, reticulate but without free vein-endings in the long narrow areolae; streaked on the lower surface with short, brown false veins. *Terrestrial Forms:—Stipes* 6 to 25.5 cm. in length, 0.5 to 1.2 mm. broad, cylindrical, glabrous, dilated towards the apex. *Sterile lamina* 4-lobed, green, paler on the lower surface, sub-membranous to very thinly coriaceous, 0.8 to 4.5 cm. broad, glabrous or with one or several long, unbranched, white hairs near the junction of the leaflets with the stipe. *Leaflets* contracted near the base, narrow obovate-cuneate (2:1) to very broadly obovate-cuneate (6:6), 0.4 to 1.9 cm. long and 0.3 to 2.2 cm. broad, the apex broadly rounded, the margin entire or very slightly crenate, the venation as in the floating forms. *Pedicels of the sporocarps* erect or oblique, arising at the base of the sterile fronds or more usually on short auxiliary branches which are attached to the stipes of the sterile fronds at a distance of 1 to 7 mm. from the base; rarely unbranched with one sporocarp, usually forked once to thrice, i.e., bearing 2 to 4 sporocarps; light red, light red-brown or light brown, 0.7 to 2 cm. long and 0.3 to 1 mm. broad; glabrous except for a few, simple, fawn, silky hairs near the base. *Conceptacles of the sporocarps* erect, oblique, horizontal or deflexed, hard and woody, almost orbicular, obliquely ovoid or club-shaped, 3 to 4.5 mm. long, 2.5 to 5 mm. broad, often markedly truncate at the apex, shallowly to deeply grooved on the dorsal surface, carinate below, glabrescent or clothed with a dense felt of simple, fawn or greyish-brown, warted but non-tuberculate hairs, the basal teeth absent. *Sori* 7 to 8 in each of the two valves.

New Caledonia: In locis inundatis prope Wagap (Mett. fil. Nov. Caled., No. 128), Vieillard No. 1698 (KEW); in aquis quietis prope Wagap, Vieillard No. 1698 (P.); in aquis stagnantibus prope Zoye, Vieillard No. 1698 (P.); Île Nou, I. Franc, 1905 (P.); mares d'eau douce situées près du Pont des Français, Balansa No. 1532, 8.1869 (P.); marais . . . Noumea (Anse Vata), Franc No. 2096 Série A, 6.1917 (P.); La Conception, fossés et mares, Brousmiche, 12.5.1882, reçu 1.1884 (P.); no specific localities, I. Franc NSW. P3096 and P3097).

Australia: New South Wales: Runnymede, Richmond River, A. Edwards, 19.11.1888 (MEL.); William's River, on low-lying land, A.T.R. Brown, 12.1948 (NSW. P4979), terrestrial form; Port Jackson district, E. Betche, 11.1898 (NSW. P453 and P528), terrestrial and floating forms; Richmond, in the mud at the edge of a lagoon, M. Tindale, 3.1.1949 (NSW. P5656); Richmond, J. L. Boorman, 4.1906

(NSW. P355 and P350), terrestrial form; Hawkesbury River, shallow water aquatic, H. Major, 9.1932 (SYD.); Nepean River, near Penrith, floating on the river about 10 feet from the bank, M. Tindale, 28.2.1944 (NSW. P139); Glenbrook Creek, near Penrith, in mud at the side of the creek forming dense masses, M. Tindale, 28.2.1944 (NSW. P317), terrestrial form; Glenbrook Creek, tributary of Nepean River, amphibious herb, growing in mud on the river bank and at the edge of the water, M. Tindale, 28.2.1944 (NSW. P137); Nepean River, near Penrith, growing in deep water near the edge of the river, plant 18 inches to 2 feet high, E. F. Constable, 14.2.1949 (NSW. P4939); Penrith, growing in a pool away from the river, E. F. Constable, 14.2.1949 (NSW. P4940); Kenmore, near Goulburn, H. Fester (NSW. P457).

Queensland: Enoggera Reservoir, in mud near the edge, larger plants further in the water, C. T. White, F. W. C. Excursion, 13.10.1928 (BRI.); Enoggera Dam, F. M. Bailey (BRI.).

Cultivated: Berlin, cultivated from Australian material, A. Grant, 1906 (NSW. P351), germination, very young stages.

After a comparison of the holotypes of *Marsilea mutica* and *M. brownii,* I have concluded that they are conspecific. The species in Australia must now be known as *M. mutica,* as Mettenius' name antedates that of Alexander Braun. Both type-specimens have glabrous leaflets as well as sporocarps lacking the basal teeth so characteristic of most species of *Marsilea.* Also the hairs on the fruits are warted but lack the numerous, small tubercules so common in most species of this genus. A closely allied species is *Marsilea quadrifolia* L., native of Europe, and introduced into North America. It is superficially very similar to *M. mutica,* since the leaflets are glabrous and the sporocarps are in clusters of mostly two or three on a short peduncle arising from near the base of the stipes. It differs from *M. mutica* by having two small basal teeth present on the sporocarps.

It is true that the percentage of single sporocarps arising at the base of the stipes is greater in the New Caledonian material examined than in the Australian material. However, clusters of sporocarps borne on short peduncles arising above the bases of the stipes do occur in material from both countries, as in R. L. Specht No. 1225 collected at Oenpelli, Arnhem Land, N.T. (AD.; NSW.).

M. mutica is not a common species in eastern Australia but is mainly found in the coastal rivers, creeks or dams, either floating on shallow water or growing in the mud on the banks. The laminae of the floating fronds are always much larger than those of plants growing at the water's edge. Records of this species from the inland of Australia are less common, although it was collected by E. F. Constable recently in the Baradine district at Carmel Lagoon, Teridgerie (NSW. P3087). Its distribution is probably far wider than this, as water plants are frequently overlooked by collectors.

ACKNOWLEDGMENTS.

In conclusion I should like to express my gratitude and appreciation for the facilities afforded by the directors and keepers of the following institutions:—The Herbarium, Kew; The British Museum of Natural History, South Kensington; the Natural History Museum, Paris; the Botanical Institute, University of Florence; the Natural History Museum, Vienna; the National Herbarium, Melbourne; the Botanic Museum and Herbarium, Brisbane; the Botany Department, University of Sydney; and the National Herbarium, Sydney. I should also like to thank the following persons who assisted me in various ways:—Mme. M. Tardieu-Blot, Dr. P. Brough, Mr. A. H. G. Alston, Dr. R. Pichi-Sermolli, Mr. F. Ballard, Mr. L. S. Smith, Miss J. Vickery and Mr. J. A. Crabbe. The photographs of the type specimen of *Athyrium assimile* and *Hemitelia australis* are published with the permission of the Keeper of Botany, the British Museum of Natural History (Dr. G. Taylor); they were taken by one of the staff photographers.

2221804

A Key to the Genera of Rhodophyceae (Red Algae) Hitherto Recorded from Australia

VALERIE MAY, M.Sc.

INTRODUCTION.

At the time the author published "A Key to the Marine Algae of New South Wales, Part I Chlorophyceae" and "Part II Melanophyceae" (Proc. Linn. Soc. N.S.W. 63 (1938), 207-218 and 64 (1939), 191-215) it was intended to complete a Part III Rhodophyceae of this series. Further work, however, indicated the desirability of extending the key to include Rhodophyceae found on the coast of the whole of Australia. With this extension of range it was decided to limit the key to genera only.

The marine flora of Australia has been relatively little studied, and the existing information is very scattered. Up to the present it has been difficult for the beginner to identify specimens for a thorough acquaintance with the literature was necessary before identification could be attempted with any sense of certainty and reference made to the correct comparative material for verification. The writer, therefore, considers a readily available key to the large group Rhodophyceae, at least to genera, would be of general use.

In preparing such a work there have been innumerable difficulties. Many of the species recorded from our coast are inadequately known or described, and many genera also at present stand in need of revision. As the key has been designed with the object of providing a convenient and speedy means of identification, free use has been made of characters which may be superficial rather than fundamental. Critical work on the Rhodophyceae has resulted in many of the fundamental divisions being based on cytological and embryological information which is not readily determinable, and therefore unsuitable for use in the type of key here presented. However, the use of superficial characters inevitably poses other problems. For instance, where some readily observable character such as "terete" contrasted with "flattened" thallus is used in the key, it is found that in certain genera (and even species) this character varies; in such cases the genus has been included in both divisions. Similarly genera may include species which differ in the presence or absence of branching as contrasted with lobing of the thallus. Because of cases such as this it must be understood that the present key aims only at distinguishing between Australian species of the genera included, and the characters used must not be assumed necessarily to provide infallible guides to essential generic distinctions.

It should also be remembered that it is probable that the Australian marine flora contains many other species as yet undescribed or unrecorded, some of which might cut across the arbitrary key distinctions which have been used.

Experience has shown that characters such as size and colour are misleading, since they vary with the environment under which the plant grows, and these characters have, therefore, been used very little in the present paper.

In preparation of the key the writer has consulted all the literature available to her. Newton's key in her "Handbook of the British Seaweeds" (1931) has proved a useful model.

Many of the genera in the present key are included by Lucas in "Revised List of the Fucoideae and Florideae of Australia," (Proc. Lin. Soc. N.S.W. 34 (1909), 9-61) and his "Supplementary List of the Marine Algae of Australia" (Ibid. 37 (1912), 157-171). Since then there have been many additions to the flora, transfers of species and revisions of genera, and due note has been taken of these in the course of the present work.

Genera previously accepted as occurring in Australia but not included in the present key are listed below, together with the genus (or genera) which holds priority over them or under which such of their species as have been recorded from Australia are now included.

Genus previously recorded from Australia.	*Genus or genera under which the species concerned are now recognised.*
Amphiplexia J.Ag.	*Binderella* Schmitz
Brachycladia Sond.	*Galaxaura* Lamour.
Chantransia (D.C.) Schmitz	*Acrochaetium* Naeg.
Chondrococcus Kuetz.	*Desmia* Lyngb.
Cruoria Fries	*Rhodopeltis* Harv.
Dermatolithon Foslie	*Lithophyllum* Phil.
Dolichoscelis J.Ag.	*Coeloclonium* J.Ag.
Erythrocolon J.Ag.	*Coelarthrum* Borg.
Fauchea Bory et Mont	*Leptofauchea* Kylin and *Faucheopsis* Kylin
Gastroclonium Kuetz	*Chylocladia* Grev.
Grunowiella Schmitz	*Gloiophyllis* J.Ag.
Halichrysis (Schousb.) Schmitz	*Chrysymenia* J.Ag.
Litharthron W. et B.	*Rhodopeltis* Harv.
Martensia Hering.	*Mesotrema* J.Ag.
Mastophora Decne.	*Metamastophora* Setch.
Meristotheca J.Ag.	*Faucheopsis* Kylin
Monospora Solier	*Neomonospora* Setch. et Gard.
Pollexfenia Harv.	*Jeannerettia* H. et H.
Prionitis J.Ag.	*Zanardinula* De Toni
Rhodoglossum J.Ag.	*Iridaea* Bory.
Rhodoseris Harv.	*Botryoglossum* Kuetz.
Sarcocladia Harv.	*Curdiea* Harv.
Tolypiocladia Schmitz	*Roschera* Sond.
Wildemania De Toni	*Porphyra* Ag.

The genus *Chondrosiphon* Kuetz, with one recorded species *C. novae-hollandiae* Kuetz, is omitted from the key since the correct genus to which this species should be referred is not known. Another genus, *Perischelia,* J.Ag. with one species *P. glomerulifera* (J.Ag.) J.Ag., is included, but with some diffidence as it is insufficiently known and perhaps should still be included under *Thamnocarpus* Harv.

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KEY TO THE GENERA.

The style adopted in the printing of the following key differs slightly from that commonly used, but the differences should present no difficulties to anyone familiar with the use of botanical keys. It is strictly dichotomous with juxtaposed pairs of characters. Alternate pairs of contrasting characters are inset or outset only to facilitate quick reading, and this arrangement has no other significance. Arbitrary major divisions which separate larger groups of genera are set out to the margin, again purely for the sake of ready reference. The writer has experienced the benefit of this arrangement in practice.

RHODOPHYCEAE.

1 No obvious protoplasmic continuity between the cells 2
1* Protoplasmic continuity obvious between the cells 6
    2 Frond flat, membranaceous or horizontally expanded 3
    2* Frond filiform, structure often irregular 4
        3 Plant independent or epiphytic, with upright blades; surface glossy **Porphyra** *Ag.*
        3* Plant microscopic, epiphytic, horizontally expanded. Branches more or less compacted laterally **Erythrocladia** *Rosenv.*
    4 With wide gelatinous sheath and pseudo-branching. Epiphytic only **Goniotrichum** *Kuetz.*
    4* Without wide gelatinous sheath; unbranched 5
        5 Mostly monosiphonous. Gonidia formed from portions of the vegetative cells. Epiphytic. Plant up to 1 cm. high **Erythrotrichia** *Aresch.*
        5* Mostly polysiphonous. Gonidia formed from entire vegetative cells. Epiphytic or epilithic; if epiphytic, up to 4 cm. high **Bangia** *Lyngb.*

6 Thallus obviously encrusted with lime (effervescing on treatment with dilute acid) 7

6* Thallus not obviously encrusted with lime 26

7 Thallus endophytic, forming wart-like conceptacles on *Corallina* sp. .... **Choreonema** *Schmitz*

7* Thallus not endophytic 8

8 Thallus encrusting 9

8* Thallus not encrusting 15

9 Attached by rhizoids. Conceptacles absent .... **Peyssonnelia** *Decne.*

9* Rhizoids absent. Conceptacles present 10

10 Sporangia never grouped in conceptacles; often in zone-like sori .... **Archaeolithothamnion** *Rothpl.*

10* Sporangia grouped in conceptacles 11

11 Tetrasporic conceptacle with one ostiole 12

11* Tetrasporic conceptacle with more than one ostiole 14

12 Vegetative thallus consisting of hypo- and peri-thallium 13

12* Vegetative thallus usually monostromatic; if not, then no differentiation into hypo- and peri-thallium .... **Fosliella** *Howe*

13 Heterocysts present in thallus .... **Goniolithon** *Fosl.*

13* No heterocysts present in thallus .... **Lithophyllum** *Phil.*

14 No differentiation into hypo- and peri-thallium. Usually slight, epiphytic .... **Melobesia** *Lamour.*

14* Vegetative thallus of hypo- and peri-thallium. Massive, free-growing .... **Lithothamnion** *Phil.*

15 Thallus with definite articulations and a thick coating of lime, i.e., thallus not flexible 16

15* Thallus without (or with inconspicuous) articulations. Lime thin; thallus flexible 21

16 Conceptacles terminal. Nodes not cartilaginous 17

16* Conceptacles not terminal. Nodes usually cartilaginous 18

17 Branches wholly or partially pinnate, sometimes compressed .... **Corallina** *Lamour.*

17* Branches regularly dichotomous or dichotomous-cymoid. Terete .... **Jania** *Lamour.*

18 Branches stellate from nodes, terete. Conceptacles scattered. Intergenicular medullary cells in transverse zones of equal length. Nodes cartilaginous .... **Metagoniolithon** *W. v. B.*

18* Branches not stellate from nodes 19

19 Branches dichotomous. Nodes cartilaginous 20

19* Branches not dichotomous. Nodes not markedly cartilaginous. Conceptacles on upper parts of upper lobes. Segments sagittate .... **Cheilosporum** *Aresch.*

20 Segments narrow. Conceptacles scattered. Intergenicular medullary cells in transverse zones of long and short cells .... **Amphiroa** *Lamour.*

20* Segments wide .... **Rhodopeltis** *Harv.*

21 Plant frondose to membranaceous 22

21* Plant not as above 24

22 Dorsiventral, plane. Conceptacles absent. Rhizoids present 23

22* Stipitate, caulescent. Conceptacles present. Rhizoids absent .... **Metamastophora** *Setch.*

23 Thallus consists of mesothallium and upper perithallium only .... **Peyssonnelia** *Decne.*

23* Thallus consists of mesothallium and upper and lower perithallium .... **Ethelia** *W.v.B.*

24 Calcareous layer inside thallus. Axis of vertical filaments surrounded by stratum of horizontal peripheral filaments which are distinct .... **Liagora** *Lamour.*

24* Calcareous layer at outer edge of thallus, which is moderately firm 25

25 Without a special wall around the gonimoblasts .... **Galaxaura** *Lamour.*

25* Sterile wall tissue surrounds gonimoblasts .... **Actinotrichia** *Decne.*

26 Thallus filamentous or cylindrical; sometimes compressed or restricted at intervals; not membranaceous 27

26* Thallus much flattened to membranaceous or leaf-like 190

27 Minute parasite on *Centroceras* .... **Episporium** *Moeb.*

27* Not as above 28

28 Thallus, or portions thereof, tubular and sometimes constricted at intervals, with or without diaphragms at the nodes 29

28* Thallus not tubular 37

29 Forming tufts 1-3 cm. high, purple or nearly black. Branching di- or tri-chotomous. Lax filaments in axial portion, compact filaments at periphery. Plants associated with mangrove swamps. Tetrasporangia zonately divided .... **Catenella** *Grev.*

29* Not tufted nor purple-black as above 30

30 Thallus solid, bearing hollow balloons 31

30* Thallus hollow; sometimes with constrictions or diaphragms 32

31 Balloons longer than axis .... **Gloiosaccion** *Harv.*

31* Balloons shorter than axis .... **Botryocladia** *Kylin*

32 Frond a loose open network, with anastomosing filaments .... **Halodictyon** *Zan.*

32* Frond not as above 33

33 When a layer of large central cells is associated with smaller cells, it is only one cell deep (except perhaps at node). Tetrasporangia cruciately divided 34

33* When a layer of large central cells is associated with smaller cells it is more than one cell deep. Tetrasporangia tetrahedrally divided 35

34 Tetraspores in sori. Diaphragms absent .... **Bindera** *Harv.*

34* Tetraspores scattered on surface. Diaphragms and constrictions present in cylindrical thallus which is di- or trichotomous. Glandular cells on stellate cells which arise on inside of membrane walls .... **Coelarthrum** *Borg.*

35 With diaphragm constrictions between branches 36

35* Without diaphragm constrictions between branches **Lomentaria** *Lyngb.*

36 Cystocarps without obvious ostiole ...... **Chylocladia** *Grev.*

36* Cystocarps with obvious ostiole ...... **Champia** *Desv.*

37 Monosiphonous axis visible at least in younger parts. Pericentral siphons absent 38

37* Monosiphonous axis with a ring of pericentral siphons, or having the centre occupied by a central core of cells 101

38 Hollow cortical zones at internodes ...... **Gattya** *Harv.*

38* No such hollow cortical zones 39

39 Frond spongelike, of filaments about a central axis. Apices of these filaments fastigiate forming periphery of frond. Frond compressed ...... **Ptilocladia** *Sond.*

39* Not as above 40

40 Filaments ecorticate throughout (occasionally very old tissue has secondary cortex developed) 41

40* Filaments partly or completely corticate 57

41 Sporangia usually undivided, i.e., monospores produced 42

41* Sporangia usually each produce four spores 44

42 Plant microscopic, endo- to epiphytic. Little branched. Spores terminal ...... **Acrochaetium** *Naeg.*

42* Plant few to many cms. high 43

43 Branching not verticillate ...... **Neomonospora**† *Setch. et Gard.*

43* Branching verticillate ...... **Batrachospermum** *Roth.*

44 Bearing whorls of more than four ramuli at the nodes 45

44* Branching of another form 47

45 Not gelatinous ...... **Wrangelia** *Ag.*

45* Gelatinous 46

46 Tetrasporangia tetrahedrally divided or bi-spores produced. Plant densely tufted. Epiphytic ...... **Crouania** *J.Ag.*

46* Tetrasporangia zonately divided. Plant much branched, but not tufted. Lithophytic ...... **Dudresnaya** *Bonnem*

47 Tetrasporangia cruciately divided; 2 to 4 ramuli arising at each node 48

47* Tetrasporangia tetrahedrally divided and usually lateral 50

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† The generic name *Neomonospora* was substituted for the better known *Monospora* Solier by W. A. Setchell and N. L. Gardner on Page 86 of their paper "The Templeton Crocker Expedition of the Californian Academy of Sciences, 1932, No. 31. A Preliminary Report on the Algae," Proc. Calif. Acad. Sci., 4th Ser. 22 (2) 65-98, pls. 3-25, 1937.

The new combinations of some Australian species have not yet been published. These species are as follows:—

Neomonospora australis (*Harv.*) **n. comb.**; *Corynospora australis* Harv. in Trans. Irish Acad., XXII, 559; Phyc. Austral., tab. 253; *Monospora australis* (Harv.) J. Ag.

Neomonospora gracilis (*Harv.*) **n. comb.**; *Corynospora gracilis* Harv. in Trans. Irish Acad., XXII, 559; Phyc. Austr. Syn., p.L., n. 661; *Monospora gracilis* (Harv.) J. Ag.

Neomonospora arachnoidea (*Harv.*) **n. comb**; *Corynospora arachnoidea* Harv., Fl. Tas., II, 333; *Monospora arachnoidea* (Harv.) J. Ag.

Neomonospora flabelligera (*Harv.*) **n. comb.**; *Callithamnion flabelligerum* Harv. in Trans. Irish Acad., XXII, 562; Phyc. Austral. Syn., n. 683; *Monospora flabelligera* (Harv.) Schmitz.

48 A pair of opposite pinnae and also a single pinna arise from each segment of main axis. Apical glands present ... **Acrothamnion** *J.Ag.*

48* Not as above ... 49

49 Cystocarps terminal ... **Antithamnion** *Naeg.*

49* Cystocarps in axils of short branches. Frond rigid, dendroid, covered with short hair-like filaments ... **Ballia** *Harv.*

50 Cells visible to naked eye. Tetrasporangia borne at the nodes on inner side of whorled incurved reproductive ramuli ... 51

50* Cells not visible to naked eye. Tetrasporangia not borne on special whorled ramuli ... 52

51 Cystocarp with gelatinous envelope ... **Griffithsia** *Ag.*

51* Cystocarp without gelatinous envelope ... **Bornetia** *Thur.*

52 Habit spongiose. Plant terete ... 53

52* Habit not spongiose ... 54

53 Frond a loose open network, with anastomosing filaments ... **Halodictyon** *Zan.*

53* Frond spongiose by enfolding lateral branches ... **Spongoclonium** *Sond.*

54 Cystocarp in gelatinous envelope ... 55

54* Cystocarp naked ... 56

55 Cystocarps and tetrasporangia lateral. Branching alternate. Older branches may show cortication ... **Callithamnion** *Lyngb.*

55* Cystocarps and tetrasporangia terminal. Frond globose; filaments simple below, fastigiate above ... **Lejolisia** *Born.*

56 Cystocarps usually in pairs. Tetrasporangia scattered. Central axis always very much larger than any later-developed cortex ... **Thamnocarpus** *Harv.*

56* Cystocarps not in pairs, terminal. Tetrasporangia on inner side of branches. Branches usually opposite ... **Spermothamnion** *Aresch.*

57 Cortication restricted to the nodes, at least in branches of the second order 58

57* Cortication not restricted to the nodes ... 59

58 Branching dichotomous or sub-pinnate. Apices often forcipate. Tetrasporangia tetrahedrally divided, occurring in cortical cells ... **Ceramium** (*Wigg.*) *Ag.*

58* Branching irregular. Tetrasporangia tetrahedrally divided and lateral on ramelli ... **Spyridia** *Harv.*

59 Cortication not complete ... 60

59* Cortication covering the whole thallus ... 73

60 Lower ramuli conspicuously attenuated. Plant contains slight amount of lime ... **Bracebridgia** *J.Ag.*

60* Not as above ... 61

61 More than four spores produced per sporangium ... **Pleonosporium** *Naeg.*

61* Not as above. Tetrasporangia usually tetrahedrally divided 62

62 Whorls of monosiphonous filaments arise at nodes ... 63

62* No whorls of monosiphonous filaments at nodes ... 67

63 Pencils of hairs arising at nodes, originally produced in twos or threes. Tetrasporangia (?) cruciately divided ..... **Warrenia** (*Harv.*) *Kuetz.*

63* Without pencils of hairs as above. Tetrasporangia tetrahedrally divided or bispores produced 64

64 Gelatinous, tufted epiphyte ..... **Crouania** *J.Ag.*

64* Not gelatinous 65

65 Cystocarps in lower parts of lateral branches and very small. Branching in one plane; vertical whorls originally in fours, later becoming pilose from thick secondary cortex ..... **Muellerena** *Schmitz*

65* Cystocarps terminal or on terminal pinnules 66

66 Cystocarps terminal, with pericarp ..... **Ptilota** *Ag.*

66* Cystocarps on terminal pinnules; pericarp absent ..... **Wrangelia** *Ag.*

67 Decurrent filaments finally united to form tube about axis **Haliacantha** *J.Ag.*

67* Not as above 68

68 Cystocarp with pericarp, terminal. Tetrasporangia tetrahedrally divided ..... **Spyridia** *Harv.*

68* Cystocarp without pericarp (unknown in *Perischalia*) 69

69 Cystocarp in gelatinous envelope. Vegetative cells often multinucleate ..... **Callithamnion** *Lyngb.*

69* Cystocarp not in genatinous envelope, but naked 70

70 Tetrasporangia usually cruciately divided or bispores produced. Seirospores may occur ..... **Seirospora** *Harv.*

70* Tetrasporangia tetrahedrally divided (unknown in *Perischalia*) 71

71 Cells of main axis not distinctive in size from cells of cortex in corticated part of thallus ..... **Lasiothalia** *Harv.*

71* Cells of main axis distinctive in size from those of cortex 72

72 Adult ramelli rigid, with rows of spinules. Plant red **Perischelia** *J.Ag.*

72* Habit not as above ..... **Thamnocarpus** *Harv.*

73 Apices usually forcipate 74

73* Apices not forcipate 75

74 Cortication very irregular ..... **Ceramium** (*Wigg.*) *Ag.*

74* Cortication regular, cells sub-rectangular and in series ..... **Centroceras** *Kuetz.*

75 Provided with rhizines 76

75* Without rhizines 77

76 One ostiole per cystocarp ..... **Pterocladia** *J.Ag.*

76* Two ostioles per cystocarp. Rhizines originate outside medulla (except in *G. pusillum*) ..... **Gelidium** *Lamour.*

77 Thallus markedly compressed at least in the upper parts 78

77* Thallus terete 90

78 Branches alternate secund ..... **Plocamium** *Lamour.*

78* Branches not alternate secund 79

79 T.S. thallus shows filaments 80

79* T.S. thallus shows no filaments 82

80 Frond dentate with proliferations ..... **Phacelocarpus** *Endl. et Dies.*

80* Frond not as above 81

81 Tetrasporangia zonately divided. Cystocarps external ..... **Stenocladia** *J.Ag.*

81* Tetrasporangia tetrahedrally divided. Cystocarps internal ..... **Areschougia** *Harv.*

82 Apices sunk in obtuse branch tips ..... **Laurencia** *Lamour.*

82* Apices not sunk in obtuse branch tips 83

83 Articulations usually visible. Cortex of large cells, outer layer of small cells. Branching pinnate ..... **Microcladia** *Grev.*

83* Not as above 84

84 T.S. shows one row of large cells in cortex then many small cells. Branching pinnate, but final branches alternate. **Bonnemaisonia** *Ag.*

84* Not as above 85

85 Tetrasporangia zonately divided. Branches usually with pinnulate proliferations. Cortex parenchymatous **Delisea** *Lamour.*

85* Tetrasporangia not zonately divided 86

86 Tetrasporangia cruciately divided and occurring in branch tips. Branches spiny to pinnate ..... **Gelidiella** *Feldm. et Hamel*

86* Tetrasporangia tetrahedrally or irregularly divided 87

87 Cystocarps terminal on primary branches. Cortex parenchymatous ..... **Rhodocallis** *Kuetz.*

87* Cystocarps not terminal on primary branches 88

88 Apices often inrolled. Cortex parenchymatous ..... **Desmia** *Lyngb.*

88* Apices not inrolled 89

89 Branches alternate, with short pinnate proliferations ..... **Psilothallia** *Schmitz*

89* Branches pinnate ..... **Euptilota** *Kuetz.*

90 Cortication does not include inner layer of filaments, though inner cells may be somewhat elongated 91

90* Cortication includes inner layer of filaments 92

91 Apices obtuse ..... **Laurencia** *Lamour.*

91* Apices acute (original polysiphonous structure quite obscured extremely early) ..... **Rhodomela** *Ag.*

92 Branches constricted at intervals 93

92* Branches not constricted at intervals 94

93 Main axis surrounded by filaments then a layer of rounded cells then a vertically seriate cortex ..... **Erythroclonium** *Sond.*

93* Main axis surrounded by a layer of corticating filaments then by lateral branches from the nodes united distally to form a continuous small-celled surface layer. Plant very gelatinous ..... **Gulsonia** *Harv.*

94 Branches of two unlike sorts ..... **Asparagopsis** *Mont.*

94* Branches alike 95

95 T.S. shows cortex of ring(s) of large parenchymatous cells set among filaments (T.S. lower shows only filaments surrounding central cell). Plant wholly covered with fine hairs ..... **Dasyphila** *Sond.*

95* Cortex not as above 96

96 Plant bears fine hairs from surface or nodes 97

96* Plant not hairy 98

97 Main axis surrounded by loose filaments, then cortical tissue of rounded cells. Plant periphery bears fine hairs. Tetrasporangia zonately divided .... **Dasyphloea** *Mont.*

97* Only corticating filaments (no parenchyma) produced. Branched filaments from nodes appear as tufts of hair. Monospores produced .... **Batrachospermum** *Roth.*

98 Branches opposite, distichously pinnate. Tetrasporangia tetrahedrally divided. Plant cartilaginous .... **Spencerella** *Darbish.*

98* Branches not as above 99

99 Plant dentate with proliferations .... **Phacelocarpus** *Endl. et Dies.*

99* Plant not as above 100

100 Tetrasporangia tetrahedrally divided. Cystocarps internal .... **Areschougia** *Harv.*

100* Tetrasporangia zonately divided. Cystocarps external .... **Stenocladia** *J.Ag.*

101 Axis of one central, and two or more pericentral siphons, with or without cortication 102

101* Axis of a core of cells, with cortication of various forms, or main axis now lost in cortication 147

102 Two or more pericentral cells per length of central cell .... **Bostrychia** *Mont.*

102* One pericentral cell per length of central cell 103

103 Marginal " flanking " cells half length of pericentral cell occur on flattened branches 104

103* Not as above. No such marginal " flanking " cells present 106

104 Flanking cells occur only on some branches .... **Taenioma** *J.Ag.*

104* Flanking cells occur on all branches 105

105 Branches ecorticate .... **Platysiphonia** *Borg.*

105* Branches corticate .... **Sarcomenia** *Sond.*

106 Ramuli wholly or in part monosiphonous 107

106* Ramuli polysiphonous; sometimes bearing trichoblasts 119

107 Many monosiphonous hairs or ramelli occur. Branches from all sides 108

107* Monosiphonous hairs not numerous 112

108 Hairs simple. Plant early corticate 109

108* Hairs branched 110

109 Pericentral cells (four) not clearly shown. Plant large, soft and gelatinous .... **Holotrichia** *Schmitz*

109* Pericentral cells (five) clearly shown .... **Lophothalia** *Kuetz.*

110 Cortication developed early. Four pericentral cells. Tetrasporangia cruciately divided .... **Doxodasya** *Schmitz*

110* Cortication absent or only developed in old tissue 111

111 Tetrasporangia zonately divided. Cystocarp without pericarp .... **Dudresnaya** *Bonnem.*

111* Tetrasporangia tetrahedrally divided. Cystocarp with a pericarp .... **Brongniartella** *Bory*

112 Monosiphonous region very short, near apex 113

112* Monosiphonous region usually clearly shown 115

113 Tetraspores in articulations of branches. Usually uncorticated. Branches from all sides .... **Polysiphonia** *Grev.*

113* Tetraspores in stichidia 114

114 Plant up to 5 mm. high, rigid; not corticated. With five to seven pericentral cells .... **Chamaethamnion** *Falk.*

114* Plant 9-14 cm. high, slightly dorsiventral, with parenchymatous cortex. Pericentral cells five near base, four near apices .... **Wilsonaea** *Schmitz*

115 Ultimate ramuli from upper side only of alternate branches .... **Euzoniella** *Falk.*

115* Ultimate ramuli not only from upper sides of branches 116

116 Polysiphonous region shown clearly .... **Dasya** *Ag.*

116* Polysiphonous region shown indistinctly; pericentral cells becoming transformed or separated 117

117 Fine branches arising in axils of larger branches .... **Maschalostroma** *Schmitz*

117* Not as above 118

118 Branches alternate, pinnate .... **Micropeuce** *J.Ag.*

118* Branches with short laterals on all sides .... **Dasyopsis** *Zanard.*

119 Plant dorsiventral 120

119* Plant not dorsiventral 128

120 Plant parasitic, less than 5 mm. high. Four pericentral cells .... **Haplodasya** *Falk.*

120* Plant not parasitic 121

121 Long and short branches distinct and regularly arranged; 5 or more pericentral cells 122

121* Branches not long and short as above 123

122 5-8 pericentral cells. Long and short branches alternate; pinnae dichotomous .... **Dipterosiphonia** *Schmitz et Falk.*

122* 12-18 pericentral cells. Long branches emit distichous alternate branches .... **Herposiphonia** *Naeg.*

123 Alternate branches bear branches (which may be fused) from upper surface only 124

123* Not as above 125

124 Branches separate .... **Euzoniella** *Falk.*

124* Branches fused .... **Polyzonia** *Suhr.*

125 Sporangia borne singly in segment 126

125* Sporangia not borne singly in segment 127

126 Cortex not developed. Branch apices at first curled over .... **Lophosiphonia** *Falk.*

126* Cortex finally developed. Branch apices not curled over .... **Herpopteros** *Falk*

127 Sporangia two in each pericentral segment **Ophidocladus** *Falk.*

127* Sporangia more than two in each pericentral segment **Heterosiphonia** *Mont.*

128 With two rows of pericentral cells **Digenea** *Ag.*

128* Without two rows of pericentral cells 129

129 Tetraspores borne longitudinally or spirally in the ramuli. Articulations usually visible. Ramuli usually subulate 130

129* Tetraspores scattered in the ramuli or in stichidea. Cortication complete over the whole thallus 138

130 Thallus distichous 131

130* Thallus not distichous 132

131 Four pericentral cells. Sporangia arranged spirally **Aphanocladia** *Falk.*

131* More than four (5-12), pericentral cells. Sporangia not arranged spirally **Pterosiphonia** *Falk.*

132 Three pericentral cells with other regular cells; secondary cortex absent **Falkenbergia** *Schmitz*

132* Four or more pericentral cells 133

133 More than four pericentral cells 134

133* Four pericentral cells 135

134 Final branches spirally placed, short and stiff, often recurved. 6-16 pericentral cells. Ecorticate. Cystocarp urceolate **Bryocladia** *Schmitz*

134* Branches from all sides, but not as above. Up to 24 (but not five) pericentral cells. Rarely with parenchyma all over. Cystocarp ovate or urceolate **Polysiphonia** *Grev.*

135 Parenchymatous cortex present. Plant rigid **Lophurella** *Schmitz*

135* Parenchymatous cortex absent 136

136 Bearing branches in tufts **Roschera** *Sond.*

136* Not as above 137

137 Tetrasporangia developed in upper ordinary ramuli **Polysiphonia** *Grev.*

137* Tetrasporangia borne in ramuli arising from trichoblast **Lophocladia** *Schmitz*

138 Branches wholly verticillate or umbellate **Coeloclonium** *J.Ag.*

138* Branches not as above 139

139 Ramuli flattened **Pityopsis** *Falk.*

139* Ramuli not flattened 140

140 Ramuli fusiform or claviform, thinned at insertion **Chondria** *Ag.*

140* Not as above 141

141 Ramuli spine-like, spirally arranged, with short and acute tetrasporangia in special stichidia. Urceolate ceramidea with pyriform cystospores **Acanthophora** *Lamour.*

141* Ramuli not as above 142

142 Four pericentral cells. Parenchyma copious 143

142* Five or six large pericentral cells 144

143 Distichous; branches alternate **Chiracantha** *Falk.*

143* Not distichous .... **Trigenea** *Sond.*

144 Forming cushion on *Lenomandia;* parasitic .... **Tylocolax** *Schmitz*

144* Not forming cushion, nor parasitic 145

145 Six pericentral cells; two opposite large central siphons. Main axis infolded. Tetrasporangia borne in double rows **Protokuetzingia** *Falk.*

145* Five pericentral cells. Plant hard and cartilaginous 146

146 Plant up to 60 cm. in height .... **Cladurus** *Falk.*

146* Plant up to 20 cm. in height .... **Husseya** *J.Ag.*

147 Plant consisting of a mesh of parenchymatous branched portions; plant symbiotic with a sponge .... **Ceratodictyon** *Zanard.*

147* Plant not as above 148

148 Parasitic, usually on *Chondria* or *Laurencia* **Janczewskia** *Solms.-Laub.*

148* Plant not parasitic 149

149 T.S. includes non-parenchymatous tissue 150

149* T.S. shows all parenchymatous tissue 180

150 Plant gelatinous 151

150* Plant coriaceous, firm. Periphery parenchymatous (except in *Euchema, Gigartina* and *Nematophora* 162

151 Periphery of free filaments (which may be in a gelatinous matrix and which may have few parenchymatous cells intermixed) 152

151* Periphery of thallus a pseudo-cortex 159

152 Filaments quite distinct. Plant calcareous .... **Liagoria** *Lamour.*

152* Filaments not quite distinct, but held in mucilage. Plant not calcareous 153

153 Medulla parenchymatous .... **Gloioderma** *Ag.*

153* Medulla not parenchymatous 154

154 Cortex includes both parenchymatous cells and filaments 155

154* Cortex of filaments only 156

155 Cortex consisting of a series of orbs of clear cells interspersed among jointed threads of small coloured cells .... **Endosira** *J.Ag.*

155* Plant not as above .... **Ardissonea** *J.Ag.*

156 Inner axis sharply delimited. Branches lateral and frequent .... **Helminthora** *J.Ag.*

156* Inner axis not sharply delimited. Branches usually dichotomous, more or less rare 157

157 Terminal cells of assimilating filaments larger than inner cells. Branches moderately frequent .... **Helminthocladia** *J.Ag.*

157* Terminal cells not the largest 158

158 Cystocarps occur in the peripheral filaments. Tetrasporangia unknown. Plant little branched .... **Nemalion** *Targ.-Tozz.*

158* Cystocarps immersed below peripheral filaments. Tetrasporangia cruciately divided. Plant moderately branched .... **Nemastoma** *J.Ag.*

159 Thallus compressed, often proliferous from the margins. Cortex of corymbose branches united to form a pseudo-parenchyma .... **Grateloupia** *Ag.*

159* Thallus terete. Inner axis not sharply delimited from the peripheral pseudo-cortex. Branches dichotomous. Gonimoblast with a pericarp 160

160 Moniliform assimilatory filaments end in large colourless cells united into a pseudo-parenchymatous epidermal layer 161

160* Epidermal layer lacking in older portions of thallus, i.e., without any colourless layer outside packed filaments. Branches much imbricate .... **Gloiophloea** *J.Ag.*

161 Gonimoblasts arise from edges as well as from base of walls of peridium .... **Pseudoscinaia** *Setch.*

161* Not as above .... **Scinaia** *Biv.*

162 Branches regularly dichotomous 163

162* Branches not regularly dichotomous 165

163 T.S. shows wide central region of filaments. Cortex of three rows of parenchyma next to small peripheral cells. Colour red-brown. Cystocarp internal. Frond compressed, tough. Tetrasporangia in sori, zonately divided .... **Acrotylus** *J.Ag.*

163* Thallus with distinctive small tightly-packed central region of intertwined strands, and much parenchymatous cortex 164

164 Large central cell in cystocarp .... **Sarconema** *Zanard.*

164* Not as above .... **Dicranema** *Sond.*

165 T.S. shows parenchyma mixed with filaments in medulla 166

165* T.S. shows only elongated cells (filaments) in centre of thallus 167

166 Two series of large central cells, one of smaller cortical cells .... **Erythronema** *J.Ag.*

166* Not as above; cells not constant in arrangement. Tetrasporangia tetrahedrally divided .... **Hymenocladia** *J.Ag.*

167 Branches decomposite-pinnate, flat, distinctly of three strata 168

167* Branches irregularly dichotomous or alternate or whorled or irregular, etc. 170

168 Periphery not distinctly parenchymatous .... **Nizymenia** *Sond.*

168* Periphery distinctly parenchymatous 169

169 Cystocarps half immersed, spores minute. A large fusion-cell together with sterile tissue present in cystocarp .... **Thysanocladia** *Endl.*

169* Cystocarps external. Most cells in cystocarp fertile, with masses of round-angular spores .... **Mychodea** *Harv.*

170 Cystocarp immersed 171

170* Cystocarp external (unknown in *Nematophora*) 174

171 Cystocarp wholly immersed in lax axial filaments 172

171* Cystocarp in intermediate cortical region which includes some parenchyma. Tetrasporangia zonately divided. Central " rib " developed below apex .... **Ectoclinium** *J.Ag.*

172 Tetrasporangia in sporophyll, cruciately divided. Thallus more or less flattened, usually covered with spinous tubercules: imperfectly costate .... **Thamnoclonium** *Kuetz.*

172* Tetrasporangia zonately divided (reports divergent regarding *Solieria*). Frond terete 173

173 No central fusion-cell in cystocarp. Thallus originally with central axis but this soon lost .... **Rhabdonia** *Harv.*

173* Very large central fusion-cell in cystocarp. Thallus never with central axis .... **Solieria** *J.Ag.*

174 Plant small and like *Gelidium* in habit. Apical cells many; central cells elongated .... **Gelidiopsis** *Schmitz*

174* Habit not as above 175

175 Periphery obviously filamentous 176

175* Periphery not obviously filamentous 178

176 Thallus with some parenchyma. Cortex grades to periphery. Tetrasporangia zonately divided .... **Eucheuma** *J.Ag.*

176* Thallus wholly filamentous. Tetrasporangia cruciately divided 177

177 Tetrasporangia produced in dense immersed sori .... **Gigartina** *Stackh.*

177* Tetrasporangia not as above .... **Nematophora** *J.Ag.*

178 Tetrasporangia zonately divided. Most cells of cystocarp fertile. Cortex of parenchyma and few filaments .... **Mychodea** *Harv.*

178* Tetrasporangia tetrahedrally divided, occurring below the cortical layer (unknown in *Binderella*) 179

179 Central cells sub-stellate .... **Corynecladia** *J.Ag.*

179* Central cells not as above. Habit as in *Bindera* .... **Binderella** *Schmitz*

180 Branches always regularly dichotomous 181

180* Branches irregularly dichotomous or alternate, pinnate or proliferous, etc. 182

181* Tetrasporangia in nemathecia at apices cruciately divided .... **Melanthalia** *Mont.*

181* Tetrasporangia in scattered nemathecia, zonately divided .... **Trematocarpus** *Kuetz.*

182 Apices obtuse with apical cell sunk in tissue .... **Laurencia** *Lamour.*

182* Apices not as above; central cells much larger than peripheral cells 183

183 Plant articulately constricted frequently, the apices truncate-pointed .... **Corallopsis** *Grev.*

183* Plant rarely or not at all articulately constricted 184

184 Plant coarse 185

184* Plant fine or small 186

185 Tetrasporangia in swollen apices of branches. Cystospores circular. Thallus always cylindrical; L.S. shows elongated central cells .... **Cordylecladia** *J.Ag.*

185* Tetrasporangia not in swollen apices of branches. Cystospores pyriform. Thallus shape variable .... **Gracilaria** *Grev.*

186 Tetrasporangia zonately divided 187

186* Tetrasporangia cruciately divided 189

187 Frond rigid .... **Heringia** *J.Ag.*

187* Not as above 188

188 Plant with basal "trunk" .... **Rhododactylis** *J.Ag.*

188* Not as above. Apices very acute .... **Hypnea** *Lamour.*

189 Constrictions at branch insertion. Frond not coriaceous ...... **Merrifieldia** *J.Ag.*

189* No constrictions as above. Frond coriaceous ...... **Gymnogongrus** *Mart.*

190 Fronds with definite midrib 191

190* Midrib indefinite or none 233

191 Thallus consists largely of anastomising nets 192

191* Not as above 196

192 Nets very fine, occurring near base of plant **Codiophyllum** *Gray*

192* Not as above. Much of plant obviously fenestrate 193

193 Tissues on either side of main axis alike ...... **Thuretia** *Decne.*

193* Tissues on either side of main axis dissimilar 194

194 One side of axis bare, fenestrated branches all arising from same side 195

194* Tissues arising from sides of axis differ, but both are represented ...... **Cliftonaea** *Harv.*

195 Branches unattached at one end occur within fenestrate portion ...... **Sonderia** *F. Muell.*

195* Not as above ...... **Claudea** *Lamour.*

196 Fronds narrow to linear-lanceolate, or lower parts consisting only of a flanged midrib 197

196* Fronds fan-shaped to leafy 214

197 Frond with pericentral cells 198

197* Frond without pericentral cells, or these lost very early (latter in *Heterocladia*) 209

198 Branching wholly dichotomous ...... **Caloglossa** *Harv.*

198* Branching not wholly dichotomous 199

199 Six pericentral cells 200

199* Less than six pericentral cells 201

200 Branching distichous, alternate. Tetrasporangia in a single series ...... **Dictymenia** *Grev.*

200* Branching opposite, pinnate. Tetrasporangia in a double series ...... **Kuetzingia** *Sond.*

201 Four pericentral cells 202

201* Five pericentral cells 203

202 Branches arising from midrib and sometimes proliferations also ...... **Sonderella** *Schmitz*

202* Branches intramarginal ...... **Sarcomenia** *Sond.*

203 Ecorticate ...... **Amansia** *Lamour.*

203* Cortication all over 204

204 No lateral branches present, though branches may proliferate from midrib or margins of frond. Stichidia and cystocarps pedicellate 205

204* Lateral branches present 206

205 Main axis obvious to naked eye and persistent ...... **Lenormandia** *Sond.*

205* Not as above; main axis soon lost ...... **Aneuria** *W. v. B.*

206 Lateral branches alternate 207

206* Lateral branches opposite .... **Enantiocladia** *Falk.*

207 Frond with narrow wings .... **Rytiphloea** *Ag.*

207* Frond with wide wings 208

208 Frond surfaces rough with wart- or spine-like processes. Lateral branches dentate .... **Osmundaria** *Lamour.*

208* Frond surface smooth. Frond serrated, often spirally twisted .... **Vidalia** *Lamour.*

209 Branching dichotomous and fastigiate, with lateral splittings from the frond .... **Melanthalia** *Mont.*

209* Not as above 210

210 T.S. shows a cortical row of large parenchymatous cells in midst of filaments. Midrib not obvious near apices. Branching dichotomo-laneiniate .... **Hennedya** *Harv.*

210* T.S. not as above 211

211 Inner tissue filamentous. Without transverse nerves 212

211* Tissue all parenchymatous, with or without nerves 213

212 Cystocarps globose, stipitate .... **Ptilonia** *J.Ag.*

212* Cystocarps almost wholly immersed .... **Carpopeltis** *Schmitz*

213 Opposite transverse nerves proceed from midrib to margin .... **Leptophyllis** *J.Ag.*

213* Without lateral nerves. From midrib region arise cylindrical branches bearing tetrasporangia and monosiphonous lateral branches .... **Heterocladia** *Decne.*

214 Apical growing cell present 215

214* Apical growing cell absent or soon obscured. Branches not arising direct from midrib. Cystocarps scattered 226

215 With four pericentral cells .... **Jeannerettia** *H. et H.*

215* Not as above 216

216 Branches arise from midrib. Cystocarps usually arise from midrib region (but not in *Neurymenia*) 217

216* Branches arise only from margins 221

217 Thallus monstromatic except at midrib, at least when young 218

217* Thallus polystromatic throughout 219

218 Microscopic veins present. Intercalary cell tissue present in midrib .... **Apoglossum** *J.Ag.*

218* Microscopic veins and intercalary cell tissue absent .... **Hypoglossum** *Kuetz.*

219 Lateral veins present .... **Neurymenia** *J.Ag.*

219* Lateral veins absent. Reproductive structures on small proliferations originating from midrib 220

220 Tetrasporangiate sori on one side of proliferations. Plant not excessively imbricate .... **Chauvinia** *Harv.*

220* Tetrasporangiate sori on proliferations in pairs, one on each side. Plant very imbricate by repeated branch formation from the midrib .... **Phitymophora** *J.Ag.*

221 Lateral veins fade at branch junction and at apices. Branching pinnate. Cystocarps on midribs .... **Hemineura** *Harv.*

221* Lateral veins, if present, do not fade at branch junctions and apices 222

222 Thallus polystromatic throughout, not serrated. Lateral veins absent. Tetrasporangiate sori at margins .... **Pachyglossum** *J.Ag.*

222* Thallus monostromatic except at midrib, at least when young 223

223 Apical cells inconspicuous .... **Myriogramme** *Kylin*

223* Apical cells conspicuous and permanent 224

224 Cystocarps on midrib. Branching dichotomous. Edges smooth. Without microscopic veins. Tetrasporangiate sori beneath the apices .... **Branchioglossum** *Kylin*

224* Cystocarps scattered 225

225 Lateral veins present. Tetrasporangia in special thickenings. Thallus with short upright proliferations .... **Halicnide** *J.Ag.*

225* Lateral veins absent. Tetrasporangia in proliferations arising from the midrib. Branches almost dichotomous; edges serrate .... **Heterodoxia** *J.Ag.*

226 With microscopic veins. Cystocarps single 227

226* Without microscopic veins 230

227 Axis with a series of leaves .... **Leveillea** *Decne.*

227* Not as above 228

228 Tetrasporangiate sori over whole surface .... **Hymenena** *Grev.*

228* Tetrasporangiate sori on flanges or small proliferations or leaves 229

229 Plant caulescent, lower part thickened, upper less coarse; dichotomous with margins very undulate so as to appear almost pinnate .... **Cryptopleura** *Kuetz.*

229* Plant thick, very cartilaginous; branching palmate; margins undulate; apices obtuse .... **Botryoglossum** *Kuetz.*

230 Cystospores not in chains 231

230* Cystospores in chains 232

231 Tetrasporangia cruciately divided, and in sori which are near the apices or on special leaves .... **Cryptonemia** *J.Ag.*

231* Tetrasporangia tetrahedrally divided, and in sori which are scattered on the thallus .... **Nitophyllum** *Grev.*

232 Thallus single-layered when young; with or without lateral veins .... **Myriogramme** *Kylin*

232* Thallus many layered throughout, with or without midrib .... **Platyclinia** *J.Ag.*

233 Thallus hollow 234

233* Thallus not hollow 235

234 Membrane solid .... **Chrysymenia** *J.Ag.*

234* Membrane a mesh .... **Halodictyon** *Zanard.*

235 Definite axile row of cells (no pericentrals) with filaments as periphery .... **Polycoelia** *J.Ag.*

235* Not as above 236

236 Thallus very heteromorphic ---------- 237

236* Not as above ---------- 238

237 Plant gelatinous. Expanded rooting base bears several fronds, each frond being narrow at base but flattened near apices and with slightly undulate margin. Cystocarps marginal on these leaves ---------- **Microgongrus** *J.Ag.*

237* Carnose membranaceous base bears stalked spathulate regions showing vague constrictions. Whole plant filamentous and sponge-like. Tetrasporangia zonately divided ---------- **Tiarophora** *J.Ag.*

238 With pericentral cells ---------- 239

238* Without pericentral cells ---------- 242

239 Four pericentral cells. Tetrasporangia alternately arranged ---------- **Jeannerettia** *H. et H.*

239* Five or more pericentral cells ---------- 240

240 Five pericentral cells ---------- 241

240* More than five pericentral cells. Tetrasporangia arranged in series in row ---------- **Symphycladia** *Falk.*

241 Ecorticate. Transversely striate by hexagonal cells in oblique rows forming membrane. Plant in parts midribbed ---------- **Amansia** *Lamour.*

241* Cortication all over. Branching only by lobing ---------- **Aneuria** *W. v. B.*

242 Thallus in the vegetative state a mesh. Frond sponge-like, of anastomosing filaments, sometimes with free surface filaments ---------- **Halophlegma** *Mont.*

242* Thallus not a mesh ---------- 243

243 Frond expanded horizontally in a creeping or encrusting layer ---------- 244

243* Thallus not encrusting ---------- 246

244 Thallus of a continuous membranaceous layer subtending erect filaments which adhere to each other ---------- 245

244* Thallus not as above, pleiostromatic. Thallus of long thin branching fronds, convex on one side ---------- **Herpophyllum** *J.Ag.*

245 Spores in special nemathecia on the upper surface. Tetrasporangia cruciately divided. Rhizoids usually present. T.S. shows mesothallium and upper perithallium present ---------- **Peyssonnelia** *Decne.*

245* Spores in special conceptacles in thallus. Tetrasporangia zonately or cruciately divided. Rhizoids absent. T.S. shows cells arranged in vertical rows ---------- **Hildenbrandtia** *Nard*

246 Thallus formed of a single mono- or poly-stromatic layer of cells without internal tissue differentation. Branches from margins ---------- 247

246* Thallus formed of an upper and lower layer of cells divided by a zone of anastomosing filaments or cells differing in size and shape from the limiting layers ---------- 252

247 Apical growing cell present. Many layered thallus. Tetrasporangiate sori at margins ---------- **Pachyglossum** *J.Ag.*

247* Apical growing cell absent or soon obscured ---------- 248

248 Microscopic veins present ---------- 249

248* Microscopic veins absent ---------- 250

249 Tetrasporangiate sori borne singly beneath apices. Apices may be infolded ...... **Acrosorium** *Zanard.*

249* Tetrasporangiate sori scattered on whole surface ...... **Hymenena** *Grev.*

250 Cystospores in chains 251

250* Cystospores single or paired. Tetrasporangiate sori scattered ...... **Nitophyllum** *Grev.*

251 Thallus single-layered when young. With or without lateral veins ...... **Myriogramme** *Kylin*

251* Thallus many layered throughout ...... **Platyclinia** *J.Ag.*

252 Internal layers entirely filamentous 253

252* Internal layers parenchymatous, sometimes traversed by or mixed with a few filamentous rows or cells 289

253 Thallus entire; sometimes lobed but unbranched 254

253* Thallus branched 264

254 Tetrasporangia cruciately divided, in immersed sori 255

254* Tetrasporangiate sori not as above 256

255 Cystocarps always immersed ...... **Iridaea** *Bory*

255* Cystocarps finally external ...... **Gigartina** *Stackh.*

256 Thallus very thick and coarse, wholly filamentous 257

256* Thallus not as above 258

257 T.S. thallus shows three tissues ...... **Pachymenia** *J.Ag.*

257* T.S. thallus shows two tissues ...... **Epiphloea** *J.Ag.*

258 T.S. includes parenchyma or at least a few rounded cells 261

268* Not as above 259

259 Plant rounded-oblong; T.S. shows very fine and lax internal tissue ...... **Glaphyromenia** *J.Ag.*

259* Plant not rounded-oblong 260

260 Plant up to 25 cm. long, broad lanceolate. Apices variable; margins often undulate proliferous ...... **Grateloupia** *J.Ag.*

260* Plant up to 4.5 cm. long, sublanceolate. Apices attentuate-obtuse ...... **Chaetangium** *Kuetz.*

261 Frond of three strata, including a definite parenchymatous layer. Cortex dense. Stalk often present. Tetrasporangia in sori ...... **Cryptonemia** *J.Ag.*

261* Frond of inner filaments, few angular parenchymatous cells, with dense peripheral cells 262

262 Medullary region lax. Cystocarp external ...... **Meredithia** *J.Ag.*

262* Medullary region denser. Cystocarp internal 263

263 Parenchymatous layer of large cells. Frond sometimes perforated ...... **Callymenia** *J.Ag.* (= *Kallymenia*)

263* Parenchymatous layer of small cells which are inconspicuous. Frond not perforated ...... **Sebdenia** *Berth.*

264 Branching dichotomous to irregular-dichotomous 265

264* Branching not dichotomous. Thallus usually more membranaceous than above 279

265 Thallus moniliform, carnose. Cystocarps immersed **Hormophora** *J.Ag.*

265* Thallus not moniliform 266

266 Tetrasporangia zonately divided 267

266* Tetrasporangia cruciately divided 269

267 Tetrasporangia at apices of frond .... **Peltasta** *J.Ag.*

267* Tetrasporangia scattered in frond 268

268 Frond of two strata .... **Stictosporum** *Harv.*

268* Frond of three strata .... **Sarcodia** *J.Ag.*

269 Cortex not differentiated into distinct layers 270

269* Cortex differentiated into distinct layers 273

270 Sporangia scattered in cortex 271

270* Sporangia in sori 272

271 Plant somewhat gelatinous. Peripheral layer of small cells, submonostromatic. Inside pericarp of cystocarp all cells become spores .... **Halymenia** *Ag.*

271* Plant not gelatinous. Peripheral layer wider. Carpospores developed singly terminally on branches within cystocarp .... **Chaetangium** *Kuetz.*

272 Cystocarps finally external .... **Gigartina** *Stackh.*

272* Cystocarps immersed .... **Polyopes** *J.Ag.*

273 Fronds narrow 274

273* Fronds wide 277

274 Midrib developed towards base .... **Carpopeltis** *Schmitz*

274* Not as above 275

275 All thallus formed of filaments. Frond gelatinous-carnose .... **Nemastoma** *J.Ag.*

275* Inner cortex consisting of rounded cells. Frond carnose-cartilaginous 276

276 Apices obtuse. Frond up to 7 cm. long .... **Zanardinula** *De Toni*

276* Apices not obtuse. Frond up to 20 cm. long .... **Sebdenia** *Berth.*

277 Thallus consisting of filaments only .... **Pachymenia** *J.Ag.*

277* Thallus consisting of filaments and also a layer of parenchymatous tissue 278

278 Cystocarps raised above surface .... **Meredithia** *J.Ag.*

278* Cystocarps almost wholly immersed. Peripheral layer of cortex thin. Basal stalk to plant sometimes present .... **Cryptonemia** *J.Ag.*

279 Layer of cortex parenchymatous, with filaments on both sides 280

279* Wholly filamentous in T.S. 284

280 Tetrasporangia in sori 281

280* Tetrasporangia scattered in thallus (unknown in *Blastophye*) 282

281 Frond firm, with slight midrib developed, often caulescent. Cystocarp immersed .... **Cryptonemia** *J.Ag.*

281* Frond gelatinous-carnose, pinnately branched. Cystocarp not known .... **Gelinaria** *Sond.*

282 Compound nucleus in cystocarp, with several masses of spores 283

282* Nucleus of cystocarp apparently simple. Frond di- tri- chotomous together with proliferations from surface and margins .... **Blastophye** *J.Ag.*

283 Frond narrow, sub-pinnately or sub-palmately branched; not perforated .... **Sebdenia** *Berth.*

283* Frond broad, vaguely branched or lobed; sometimes perforated .... **Callymenia** *J.Ag.* (= *Kallymenia*)

284 Frond linear, with branching irregularly opposite-pinnate. Frond constrictions present .... **Nizymenia** *Sond.*

284* Not as above 285

285 Tetrasporangia in groups or sori immersed in frond 286

285* Tetrasporangia scattered in cortex, cruciately divided 287

286 Cystocarp finally external. Adult thallus often clothed with short proliferations .... **Gigartina** *Stackh.*

286* Cystocarp immersed in thallus .... **Iridaea** *Bory*

287 Cystocarps immersed in inner cortex, formed below cortical filaments .... **Nemastoma** *J.Ag.*

287* Cystocarps immersed in outer layers of thallus or forming small protuberances 288

288 Corymbose branches at periphery united to form a pseudo-parenchyma .... **Grateloupia** *Ag.*

288* Peripheral layers of a few rows of small cells without corymbose arrangement .... **Halymenia** *Ag.*

289 Thallus fringed with open net-work. Cystocarps pyriform **Mesotrema** *J.Ag.*

289* Thallus not fringed with open network 290

290 T.S. shows filaments or smaller cells mixed with large central cells 291

290* T.S. not as above 295

291 Cystocarps horned .... **Faucheopsis** *Kylin*

291* Cystocarps without horns 292

292 Thallus leafy, thick, coarse and broad. Plant breadth usually equal to or greater than its length .... **Erythrymenia** *Schmitz*

292* Thallus if leafy then not thick and coarse and broad. Sometimes richly plumed 293

293 Periphery not filamentous. Tetrasporangia zonately divided .... **Gloiophyllis** *J.Ag.*

293* Periphery filamentous 294

294 Tetrasporangia cruciately divided .... **Callophyllis** *Kuetz.*

294* Tetrasporangia tetrahedrally divided .... **Hymenocladia** *J.Ag.*

295 With horns on cystocarps. Periphery obviously filamentous **Gloioderma** *J.Ag.*

295* Without horns on cystocarp 296

296 With special leaves or lobes bearing sporangial tissue. Usually dichotomous 297

296* Without special fertile leaves 298

297 Cystocarps borne on special leaves. Tetrasporangia cruciately divided .... **Epymenia** *Kuetz.*

297* Cystocarps scattered, in from margins. Tetrasporangia tetrahedrally divided .... **Chondrophyllum** *Kylin*

298 Tetrasporangia in sori or nemathecia 299

298* Not as above (Sporangia unknown in *Leptofauchea*) 303
299 Tetrasporangia zonately divided 300
299* Not as above 301
300 Plant without marginal proliferations. T.S. shows wide peripheral zone of minute cells vertically arranged .... **Tylotus** *J.Ag.*
300* Plant with marginal proliferations. T.S. shows narrow peripheral zone .... **Calliblepharis** *Kuetz.*
301 Cystocarps not scattered over frond 302
301* Cystocarps scattered over frond .... **Rhodymenia** *Grev.*
302 Cystocarps marginal, globose, sessile .... **Curdiea** *Harv.*
302* Cystocarps linear, embedded and appearing like a midrib .... **Stenogramma** *Harv.*
303 Tetrasporangia tetrahedrally or zonately divided 304
303* Tetrasporangia cruciately divided (unknown in *Leptofauchea*) 305
304 Tetrasporangia tetrahedrally divided, embedded in tissue .... **Hymenocladia** *J.Ag.*
304* Tetrasporangia zonately divided, in periphery .... **Rhodophyllis** *Kuetz.*
305 Frond irregularly lobed .... **Leptosomia** *J.Ag.*
305* Frond dichotomous or palmate 306
306 Apices pointed .... **Gracilaria** *Grev.*
306* Apices rounded or truncate 307
307 With obvious filaments in cystocarp .... **Leptofauchea** *Kylin*
307* Without obvious filaments in the cystocarp .... **Rhodymenia** *Grev.*

Summary.

In addition to the key, a list is given of certain previously recorded genera, together with the genus or genera under which the species concerned are now recognised.

New combinations are made in the genus *Neomonospora* of species removed from the genus *Monospora*.

◆

a221865

Some Marine Algae from New Caledonia collected by Mrs. R. Catala

Valerie May, M.Sc.

Introduction.

The algal flora of New Caledonia has received little attention in the past. Gepp (1922) enumerated the algae collected there by Compton in 1914. Her list comprised eighteen species, four of which were found as drift material.

Mrs. R. Catala, who was resident in New Caledonia for some time has now collected a much wider range of the algae of these interesting islands. Her enthusiasm and collecting ability has already enabled me to see 346 collection numbers, which are the subject of the present paper. It is hoped that Mrs. Catala will be able to continue her collecting work in this neglected area. Her present collection has resulted in 122 species of marine algae being recorded here; these include eight of the species already recorded by Gepp.

The only recent papers[1] to appear on the algae of Melanesia are those of Lucas on the Algae of Lord Howe Is. (1935) and of Setchell (1935) on some plants from Santa Cruz and the Solomon Islands. Another recently recorded flora which is of interest for comparison is that of Brampton Island, Queensland (May, 1951). Table I offers a comparison between these floras and that of New Caledonia; the relatively great similarity of the floras of Brampton Island and New Caledonia is a striking feature.

Mrs. Catala has supplied the following information regarding the exact location of her collecting stations by reference to their direction and distance from Noumea.

Anse Vata, 6 km. E. of Noumea. (Some collections overlap the adjacent Reef Ricaudy locations).

Ile aux Canards, E. of Noumea, a small coral island 900 metres from the shore.

Ilot du Grand Mato, 40 km. SE. of Noumea.

Ilot Signal, about 15 km. from the shore of Noumea.

Ilot Tilguit, E coast, 250 km. from Noumea.

Pointe Challeix, 3 km. E. of Noumea.

Reef Ricaudy, 8 km. E. of Noumea (by road); 2 km. E. of Anse Vata (by road).

Region de Baye, E. coast, 200 km. from Noumea.

Region du Mont Dore, E. of Noumea.

Region de Tiare, 30 km. W. of Noumea.

Acknowledgment.

My sincere thanks are due to Dr. F. Drouet of the Chicago Natural History Museum, who has kindly identified all the Myxophyceae recorded in the present paper.

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[1] W. R. Taylor's book "Plants of Bikini and other Northern Marshall Islands" is not yet available to the writer.

MARINE PHANEROGAMS.

In addition to algae, the present collection included a number of sterile marine angiosperms. *Halophila ovalis* (R. Br.) Hook. f. was found growing at the Isle aux Canards, -/5/1949, Specimen No. 273. A member of the Potomogetonaceae, probably *Cymodocea* sp. was found in the following locations: Anse Vata, -/2/1948, No. 19; -/3/1948, Nos. 50 and 76; 8/7/1948, No. 136. Reef Ricaudy, 6/6/1949, No. 261. Ile aux Canards, -/5/1949, No. 274.

TABLE 1.

The marine algal flora of New Caledonia compared with some adjacent areas.

	Number of Species			
	New Caledonia (Present paper)	Santa Cruz and the Solomon Is. (Setchell, 1935)	Lord Howe Is. (Lucas, 1935)	Brampton Is., Qld., Australia (May, 1951)
Chlorophyceae	37	12	23	21
Phaeophyceae	29	11	23	17
Myxophyceae	6	4	0	7
Rhodophyceae	50	1	50	40
Total	122	28	96	85
Number of species common to flora of New Caledonia expressed as %	—	29	23	61

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ENUMERATION OF SPECIES.

CHLOROPHYCEAE.

ULVALVES.

Family ULVACEAE.

Ulva *Linnaeus*

Ulva lactuca *L.*, 1753, p. 1163; Borgs., 1939, p. 57-58.

NEW CALEDONIA: Growing on boat, -/3/1948, No. 163; Anse Vata, 9/7/1948, No. 173.

GEOGR. DIST.: Widespread; N.S. & E. Australia.

Enteromorpha *Link*

1. **Enteromorpha intestinalis** (*L.*) *Link,* 1820, p. 5; Smith, 1944, p. 49-50, Pl. 5, figs. 4-6. *Ulva intestinalis L.*, 1755, p. 418.

A cosmopolitan and variable species.

NEW CALEDONIA: Anse Vata, -/3/1948, No. 39; Ile aux Canards, -/3/1948, Nos. 160 and 166; On ship, 18/5/1950, No. 345.

GEOGR. DISTR.: Widespread; N.S. and E. Australia.

2. **Enteromorpha** probably **plumosa** *Kuetz.*, 1843, p. 300, t. 20, fig. 1; De Toni, 1889, p. 132-133.

In the absence of more material I prefer to leave this species determination as " probable " only.

NEW CALEDONIA: Reef Ricaudy, -/7/1949, No. 346.

GEOGR. DIST.: Atlantic Ocean, Mediterranean and Adriatic Seas, West Indies, Sandwich Islands.

CLADOPHORALES.

Family CLADOPHORACEAE.

Cladophora *Kuetzing*

1. **Cladophora feredayi** *Harv.*, Alg. Aus. Exsicc. No. 584; 1858-1863, Tab. 47; De Toni, 1889, p. 323.

NEW CALEDONIA: Reef Ricaudy, 20/7/1948, No. 186; Mont Dore, -/4/1950, No. 318.

GEOGR. DIST.: Tasmania and S. Australia.

2. **Cladophora** sp.

NEW CALEDONIA: Region de Baye, 16/8/1948, No. 225.

Rhizoclonium *Kuetzing*

Rhizoclonium sp., near *R. implexum* (*Dillwyn*) *Kuetz.*

The cell size of No. 280 is somewhat greater than in No. 79.

NEW CALEDONIA: Tangled in *Cystophyllum;* Anse Vata, -/3/1948, No. 79; Ile aux Canards, -/5/1949, No. 280.

SIPHONOCLADALES.

Family ANADYOMENACEAE.

Valoniopsis *Borgesen*

Valoniopsis pachynema (*Martens*) *Borgs.*, 1934, p. 10-17; *Bryopsis pachynema* Martens, 1866, p. 24, pl. 4, fig. 2; *Valonia confervoides* Harv., Alg. Ceyl. Exsicc. No. 73; Alg. Friendly Is. Exsicc. No. 101; in J.Ag., 1886, p. 100; De Toni, 1889, p. 378.

NEW CALEDONIA: Anse Vata, -/3/1948, No. 63; Anse Vata, 8/7/1948, No. 149; Ilot Tilguit, 15/8/1948, No. 209; Reef Ricaudy, 16/6/1949, No. 251.

GEOGR. DIST.: Warm Atlantic and Indian Oceans, Ceylon, Friendly Is., Hawaiian Archipelago, Lord Howe Is., N. and E. Australia.

Family VALONIACEAE.

Valonia *Ginnani*

Valonia fastigiata *Harv.*, Alg. Ceyl. Exsicc. No. 74; Alg. Friendly Is. Exsicc. No. 100; in J.Ag., 1886, p. 101; De Toni, 1889, p. 379.

Specimens match well Harveys Friendly Island Alga No. 100.

NEW CALEDONIA: Anse Vata (Drift), -/9/1948, No. 233.

GEOGR. DIST.: Ceylon, Friendly Is., Mauritius, N.E. Australia.

Dictyosphaeria *Decaisne*

Dictyosphaeria Versluysi *W. v. B.*, 1905, p. 114.

NEW CALEDONIA: Anse Vata, -/3/1948, No. 77; Anse Vata, 8/7/1948, No. 141.

GEOGR. DIST.: Malayan Archipelago, Mexico, N.E. Australia.

Family SIPHONOCLADACEAE.

Struvea *Sonder*

Struvea delicatula *Kuetz.*, 1849-1869, t. 2, f. 2; De Toni, 1889, p. 366.

NEW CALEDONIA: Ilot Tilguit, 15/8/1948, No. 211; Mont Dore, -/4/1950, No. 320.

GEOGR. DIST.: Ceylon, Island of Guadeloupe, Mexico, W. and N.E. Australia.

Boergesenia *Feldmann*

Boergesenia Forbesii (*Harv.*) *Feldm.*, 1938, p. 18, figs. 3-5, Borgs., 1948, p. 21-22. *Valonia Forbesii* Harv. Alg. Ceylon Exsicc. No. 75; Friendly Islands Algae No. 102; in J. Ag., 1886, p. 96; De Toni, 1889, p. 374.

NEW CALEDONIA: Anse Vata, 8/7/1948, No. 158.

GEOGR. DIST.: Red Sea, Indian and Pacific Oceans, N.E. Australia.

Cladophoropsis *Borgesen*

Cladophoropsis sp.

NEW CALEDONIA: Reef Ricaudy, 6/6/1949; No. 262; Mont Dore, -/4/1950, No. 317.

Boodlea *Murray et De Toni*

Boodlea coacta (*Dickie*) *Murray et De Toni*, 1889; De Toni, 1899, p. 363; *Cladophora coacta*, Dickie, 1876, n. 87, p. 451.

NEW CALEDONIA: Anse Vata, 15/7/1949, No. 290; Ilot du Grand Mato, 18/5/1950, No. 331.

GEOGR. DIST.: Japan and Mangai Island, N.E. Australia.

Spongocladia *Areschoug*

1. **Spongocladia neocaledonica** *Grun. in Murray and Boodle,* 1888, p. 175.

New Caledonia: Anse Vata, -/3/1948, No. 74.

Geogr. Dist.: New Caledonia, Aru Islands.

2. **Spongocladia vaucheriaeformis** *Aresch.,* 1853, p. 201; De Toni, 1889, p. 360.

This species differs from the preceding by its thallus being much branched.

New Caledonia: Anse Vata, 16/6/1948, No. 117; Ilot du Grand Mato, 18/5/1950, Nos. 330 and 343.

Geogr. Dist.: Mauritius, Malayan Archipelago, New Guinea, Lord Howe Is., etc., N.E. Australia.

DASYCLADALES.

Family DASYCLADACEAE.

Dasycladus *Agardh*

Dasycladus australasicus (*Sond.*) *Cram.,* 1887, p. 37; De Toni, 1889, p. 411-412; *Chlorocladus australasicus* Sond., 1871, p. 67, t. 5, f. 1-6.

This is a rare species of which I have seen but two other collections, one from Cape York, Qld., collected by Daemel and quoted by Sonder (1871), and the other sent to me recently by the North Queensland Naturalist's Club, Cairns, Qld. (their No. 11456, 14/9/1947, from Double Island Reef, N. Qld.).

Mrs. Catala writes that at the Ile aux Canards this species grows on a rocky surface in waters protected from the wind.

New Caledonia: Anse Vata, 8/7/1948, No. 148; Ile aux Canards, -/4/1949, No. 272.

Geogr. Dist.: N.E. Australia.

Bornetella *Munier-Chalmas*

1. **Bornetella capitata** (*Harv.*) *J.Ag.,* 1886, p. 156; *Neomeris capitata* Harv. Friendly Island Algae, No. 85; 1879, p. 439; f. *brevistylis* Arn., 1912, p. 91; W. v. B., 1913-1928 (Part a), p. 90-91.

As remarked by Weber van Bosse (loc. cit.), this form is extraordinarily similar to *B. sphaerica* Zan. One needs a section of the fertile thallus to determine the species, the sporangia being oblong in the present case and spherical in *B. sphaerica.* The present specimens range up to about 1 cm. in diameter and show oblong sporangia.

New Caledonia: Mont Dore, -/4/1950, No. 321.

Geogr. Dist.: Aru Isles, Malayan Archipelago, Friendly Islands, Japan.

2. **Bornetella oligospora** *Solms-Laubach,* 1893, p. 87, Tab. 9, fig. 1-4, 6, 7.

New Caledonia: Anse Vata, 8/7/1948, No. 147.

Geogr. Dist.: Malayan Archipelago, New Guinea, N.E. Australia.

Neomeris *Lamouroux*

Neomeris van-Bosseae *Howe,* 1909, p. 80-82, pl. 1, figs. 4, 7, pl. 5, figs. 17-19. *N. dumetosa* Sond. (non Lamour.), 1871, pl. 5, f. 8-13.

Agrees with Harvey's Friendly Islands Alga No. 81 (sub nominee *N. dumetosa*).

New Caledonia: Anse Vata, 8/7/1948, No. 150.

Geogr. Dist.: Dutch East Indies, Friendly Islands, Hawaii, Mauritius, ? New Guinea, N.E. Australia.

Acetabularia *Lamouroux*

Acetabularia Kilneri *J.Ag.*, 1886, p. 171; De Toni, 1889, p. 418-419; Solms-Laubach, 1895, p. 21-22, pl. 1, fig. 6.

Collection No. 35 has shorter stems (about 2 cm.) than No. 154 (over 3 cm.).

New Caledonia: Anse Vata, -/3/1948, No. 35; Anse Vata, 8/7/1948, No. 154.

Geogr. Dist.: N. Australia.

SIPHONALES.

Family BRYOPSIDACEAE.

Bryopsis *Lamouroux*

1. **Bryopsis plumosa** (*Huds.*) *Ag.*, 1823-1828, p. 448; S. & G., 1920, p. 161-162, pl. 14, figs. 1-2. *Ulva plumosa* Huds., 1778, p. 571.

New Caledonia: Ilot Tilguit, 15/8/1948, No. 210.

Geogr. Dist.: Cuba, Barbados Is., Goree, Africa.

2. **Bryopsis ramulosa** *Mont.*, 1842*, p. 16, tab. 3, fig. 2; De Toni, 1889, p. 429.

New Caledonia: Anse Vata, 25/8/1949, No. 306.

Geogr. Dist.: Cuba, Barbados Is., Goree, Africa.

Family CODIACEAE.

Chlorodesmis *Bailey et Harvey*

Chlorodesmis comosa *Bail. et Harv.* in Harv., 1858, p. 29; *Avrainvillea comosa* (Bail. et Harv.) Murr. et Bood., 1889; De Toni, 1889, p. 515-516.

New Caledonia: Anse Vata, -/3/1948, No. 53.

Geogr. Dist.: Warm Pacific, Friendly Is., Fiji, etc., N.E. Australia.

Udotea *Lamouroux*

1. **Udotea javensis** (*Mont.*) *A. et E. S. Gepp*, 1904, p. 363-364, pl. 467, fig. 1-4; *Rhipidosiphon javensis* Mont., 1842, p. 14.

This is a rare species. The New Caledonian specimens accord with figures by A. et E. S. Gepp (loc. cit.), and in size our plant ranges from that of the Malayan specimens to nearly that of the smaller plant figured from Ceylon.

New Caledonia: Ilot Tilguit, 15/8/1948, No. 214.

Geogr. Dist.: Java, Ceylon, Malay Archipelago, Japan.

2. **Udotea orientalis** *A. et E. S. Gepp*, 1911, p. 119-120, pl. 1, fig. 1, 4, pl. 6, fig. 47-48.

New Caledonia: Ilot du Grand Mato, 18/5/1950, No. 323.

Geogr. Dist.: Indian and Pacific Oceans, N.E. Australia.

Halimeda *Lamouroux*

1. **Halimeda tuna** (*Ellis et Soland.*) *Lamour. emend. Bart.*, 1901, p. 11, pl. 1, fig. 1-6; Lamour., 1812, p. 186; *Corallina tuna* Ellis et Soland., 1786, p. 111, t. 20, fig. e.

New Caledonia: Anse Vata, -/3/1948, No. 64; Ilot Tilguit, 15/8/1948, No. 200.

Geogr. Dist.: Widespread; N. and E. Australia.

2. **Halimeda macroloba** (*Decne.*) *Bart.*, 1901, p. 24; Decne., 1841, p. 118.

New Caledonia: Anse Vata, -/3/1948, No. 73; Reef Ricaudy, 6/6/1949, No. 257.

Geogr. Dist.: Warm Indian and Pacific Oceans, Red Sea, W. and N. Australia.

3. **Halimeda incrassata** (*Ellis*) *Lamour. emend. Bart.*, 1901, p. 25; Lamour., 1812, p. 186; *Corallina incrassata* Ellis, 1755, p. 53, Tab. 25, f. A.

New Caledonia: Anse Vata, -/2/1948, No. 13.

Geogr. Dist.: Atlantic, Indian and Pacific Oceans, W. Indies, Madagascar, Malayan Archipelago, China Sea, Friendly Is., etc., N.E. Australia.

Codium *Stackhouse*

1. **Codium bulbopilum** *Setch.*, 1924, p. 173, fig. 38.

Agrees with Harvey's Friendly Island Alga No. 84. (This specimen in the National Herbarium of N.S.W. is annotated by W. A. Setchell, 1928, as being *C. bulbopilum.*

New Caledonia: Anse Vata, -/2/1948, No. 9; Anse Vata, 8/7/1948, No. 145.

Geogr. Distr.: Friendly Islands, Lord Howe Island, etc.

2. **Codium spongiosum** *Harv.*, 1855, p. 565; De Toni, 1889, p. 489-490.

New Caledonia: Anse Vata, 8/7/1948, No. 143; Ile aux Canards, 7/7/1949, No. 291.

Geogr. Distr.: W. N. and E. Australia.

Family CAULERPACEAE.

Caulerpa *Lamouroux*

1. **Caulerpa Webbiana** *Mont.*, 1838, t. 9, pl. 6; W. v. B., 1898, p. 269-271, pl. 21, fig. 1-4; *Caulerpa tomentella* Harv. Friendly Islands Alga, Exsicc. No. 79; in J.Ag., 1872, p. 8, n. 6.

f. **tomentella** (*Harv.*) *W. v B.* (loc. cit. p. 270, pl. 21, fig. 4).

Matches Harvey's Friendly Island Alga Exsicc. No. 79.

New Caledonia: Ilot Tilguit, 15/8/1948, No. 204.

Geogr. Distr.: Friendly Islands, Mauritius, etc.; N.E. Australia (this form?).

2. **Caulerpa brachypus** *Harv.*, 1859, p. 332; Yendo, 1903; *Caulerpa anceps* Harv. Alg. Fr. Island Exsicc. No. 67; in J.Ag., 1872, p. 9, n. 9; W. v. B., 1898, p. 281-282, pl. 22, fig. 6-10.

Specimen No. 237 is the smooth leaved variety of this species, while the leaves of No. 227 have serrations. Yendo (loc. cit.) has shown the great variability of this species.

New Caledonia: Region de Baye, 16/8/1948, No. 227; Region de Tiare, 30/10/1948, No. 237.

Geogr. Distr.: Friendly Islands, Japan, Java, etc., N.E. Australia.

3. **Caulerpa serrulata** (*Forsk.*) *J.Ag., emend. Borgs.*, 1932; J.Ag., 1872, p. 19; *Fucus serrulatus* Forsk., 1775, p. 188; *Caulerpa freycineti* Ag., 1823-1828, p. 446; W. v. B., 1898, p. 310-318, pl. 25, fig. 4-11, pl. 26, fig. 1-6.

Var. **typica** *W. v. B.* (loc. cit. p. 312-315, pl. 25, fig. 4-6, 8, 9.).

New Caledonia: Ile aux Canards, -/3/1948, No. 169; Reef Ricaudy, -/7/1948, No. 191.

Geogr. Distr.: Red Sea, Marianna Islands, Friendly Is., Guadeloupe, etc., N.E. Australia.

4. **Caulerpa Urvilleana** (*Mont., emend. W. v. B.*), 1898, p. 318-322, pl. 26, fig. 7-12,; Mont., 1842-1845, p. 21.

Var. **typica** (*Mont.*) *W. v. B.* (loc. cit. p. 319, pl. 26, fig. 7-11).

New Caledonia: Anse Vata, -/2/1948, No. 2; Anse Vata, 5/6/1948, No. 101; Anse Vata, 8/7/1948, No. 137.

Geogr. Dist.: Caroline, Friendly Islands, etc., N. Australia.

5. **Caulerpa cupressoides** (*Vahl.*) *Ag.*, emend. W. v. B., 1898, p. 323-338, pl. 27-28; Ag. 1823-1828, p. 441; *Fucus cupressoides* Vahl., 1802, p. 38.

Var. **lycopodium** (*Ag.*) *W. v. B.* (loc. cit. p. 335-338, pl. 27, fig. 8-13, pl. 28, fig. 10, 11, 12, 14).

New Caledonia: Anse Vata, -/3/1948, No. 67; Anse Vata, 12/6/1948, No. 124; Anse Vata, 8/7/1948, No. 152; Anse Vata, -/4/1948, No. 279.

Geogr. Distr.: Guadeloupe, Friendly Islands, Florida, N.E. Australia.

Var. **ericifolia** (*Turn.*) *W. v. B.* (loc. cit. p. 335, pl. 28, fig. 8).

New Caledonia: Reef Ricaudy, 1/7/1948, No. 192.

Geogr. Distr.: Bermuda, Jamaica.

6. **Caulerpa racemosa** (*Forsk.*) *J.Ag., emend. W. v. B.*, 1898, p. 357-373, pl. 31, fig. 5-8, pl. 32, fig. 1-7 and pl. 33; J.Ag., 1872, p. 35, n. 51; *Fucus racemosus* Forsk., 1775, p. 191.

Var. **uvifera** (*Turn.*) *W. v. B.* (loc. cit. p. 362-364, pl. 33, fig. 6, 7 and 23).

New Caledonia: Anse Vata, 12/6/1948, No. 126; Anse Vata, 8/7/1948, No. 146.

Geogr. Distr.: Red Sea, West Indies, Gaudeloupe, Ceylon, Celebes, Friendly Islands, etc.

Var. **laetevirens** (*Mont.*) *W. v. B.* (loc. cit. p. 366-368, pl. 33, fig 8).

Although included in this variety, specimen No. 263 varies greatly within the one collection.

New Caledonia: Ilot Signal, -/7/1948, No. 198; Ile aux Canards, -/5/1949, No. 263.

Geogr. Distr.: Is. of Toud, Ceylon, Florida, Guadeloupe, W. and N.E. Australia.

7. **Caulerpa peltata** *Lamour. emend. W. v. B.*, 1898, p. 373-377, pl. 31, fig. 9-11 and pl. 32, fig. 9; Lamour., 1809, p. 145, t. 3, f.e.

Var. **typica** (*Lamour.*) *W. v. B.* (loc. cit. p. 375-376, pl. 31, fig. 9).

New Caledonia: Anse Vata, -/3/1948, No. 78; Anse Vata, 12/6/1948, No. 125; Anse Vata, 8/7/1948, No. 155; Ilot du Grand Mato, 18/5/1950, No. 327.

Geogr. Distr.: Red Sea, West Indies, Ceylon, Friendly Islands, etc.

Var. **nummularia** (*Harv.*) *W. v. B.* (loc. cit. p. 376).

New Caledonia: Ilot Signal, -/7/1948, No. 197; Ilot Tilguit, 15/8/1948, No. 219: Ilot du Grand Mato, 18/5/1950, No. 328.

Geogr. Distr.: Friendly Islands, etc., N.E. Australia.

PHAEOPHYCEAE.

ISOGENERATAE.

ECTOCARPALES.

Family ECTOCARPACEAE.

Ectocarpus *Lyngbye*

Ectocarpus sp.

An unidentified species of this genus occurred as an epiphyte on *Enteromorpha intestinalis* (L.) Link. from Anse Vata (No. 39).

Family SPERMATOCHNACEAE.

Spermatochnus *Reinke*

Spermatochnus paradoxus (*Roth*) *Keutz.,* 1845, p. 268; De Toni, 1895, p. 387-388. *Conferva paradoxa* Roth, 1806, p. 172

New Caledonia: Anse Vata, -/3/1948, No. 40; Anse Vata, 8/7/1948, No. 153.

Geogr. Distr.: Atlantic Ocean, Baltic Sea, W. and S. Australia.

SPHACELARIALES.

Family SPHACELARIACEAE.

Sphacelaria Lyngbye

Sphacelaria tribuloides *Menegh.,* 1840, p. 2, n. 1; De Toni, 1895, p. 502-503.

This species recurred fairly frequently as an epiphyte.

New Caledonia: Anse Vata, -/2/1948, No. 24; Anse Vata, 5/6/1948, No. 110.

Geogr. Distr.: Mediterranean, Adriatic and Red Sea, Atlantic Ocean, Hawaii, etc., W. and N. Australia.

DICTYOTALES.

Family DICTYOTACEAE.

Pocockiella *Papenfuss*

1. **Pocockiella nigrescens** (*Sond.*) *Pap.,* 1943, p. 467. *Zonaria nigrescens* Sond., 1845, p. 50. *Gymnosorus nigrescens* (Sond.) J.Ag., 1894, p. 12; De Toni, 1895, p. 228-229.

New Caledonia: Anse Vata, -/2/1948, No. 23; Anse Vata, -/3/1948, No. 61.

Geogr. Distr.: N. S. E. and W. Australia.

2. **Pocockiella variegatus** (*Lamour.*) *Pap.,* 1943, p. 467; *Dictyota variegata* Lamour., 1809, p. 331. *Gymnosorus variegatus* (Lamour.) J.Ag., 1894, p. 11; De Toni, 1895, p. 227-228.

New Caledonia: Anse Vata, -/3/1948, No. 51; Reef Ricaudy, -/7/1948, No. 193.

Geogr. Distr.: Tropical regions of Indian, Pacific and Atlantic Oceans, Red Sea, N. and E. Australia.

Stypopodium *Kuetzing*

Stypopodium zonale (*Lamour.*) *Pap.,* 1940, p. 205-206; *Fucus zonalis* Lamour., 1805, p. 38, pl. 25, fig. 1.

My grateful thanks are due to Miss C. I. Dickinson, of Royal Botanic Gardens, Kew, England, who has kindly compared my material with other specimens of this species.

New Caledonia: Ilot de Grand Mato, 18/5/1950, No. 324.

Geogr. Distr.: W. Indies, S. Africa, Japan, N.E. Australia.

Dictyota *Lamouroux*

Dictyota dichotoma (*Huds.*) *Lamour.*, 1809,** p. 42; De Toni, 1895, p. 263-264; *Ulva dichotoma* Huds., 1778, p. 476.

Specimens Nos. 8, 20, 28 and 107 show the spores scattered over the frond leaving a clear border at the margins so that the species identification is definite in these cases. As is frequent in this species the thallus width is very variable; within the one collection (No. 28), while part is of normal width, part comes close to var. *intricata* (Ag.) Grev. (1830, p. 58).

New Caledonia: Anse Vata, -/2/1948, Nos. 5, 8, 20, 28; Anse Vata, -/3/1948, Nos. 29, 38, 45; Anse Vata, 5/6/1948, No. 107; Anse Vata, 16/6/1948, Nos. 108, 118; Anse Vata, 17/6/1948, No. 128; Reef Ricaudy, -/7/1948, No. 195; Reef Ricaudy, -/9/1948, Nos. 230, 241; Reef Ricaudy, 6/6/1949, No. 256.

Geogr. Distr.: Atlantic Ocean, Mediterranean and Adriatic Seas, Philippine and Admiralty Islands, New Zealand, Japan, South Africa, N. and E. Australia and Tasmania.

Dictyopteris *Lamouroux*

1. **Dictyopteris acrostichoides** (*J.Ag.*) *n. comb.; Haliseris acrostichoides* J.Ag., 1880, p. 133; De Toni, 1895, p. 255.

As *Dictyopteris* has been included in the list of "nomina conservanda proposita" by the Congress on International Rules, it seems wise to adopt this generic name in preference to *Haliseris* or *Neurocarpus*.

New Caledonia: Anse Vata, -/3/1948, No. 80.

Geogr. Distr.: N. S. and E. Australia and Tasmania.

2. **Dictyopteris australis** *Sond.*, 1852, p. 664; Womersley, 1949, p. 113-114; *D. pardalis* (Harv.) May, 1947, p. 274; *Haliseris pardalis* Harv. in Kuetz., 1849-1869 (Part 9), p. 24, t. 59, f. 2; De Toni, 1895, p. 258.

New Caledonia: Anse Vata, -/2/1948, Nos. 17, 25, 26; Anse Vata, -/3/1948, No. 54; Anse Vata, 17/6/1948, No. 130.

Geogr. Distr.: W. N. S. and E. Australia.

Padina Adanson

1. **Padina Commersonii** *Bory*, 1828, n. 41, t. 21, f. 2; De Toni, 1895, p. 244.

Agrees with Harveys Alg. Ceylon Exsicc. No. 55 sub nomine *P. Pavoniae.*

New Caledonia: Pointe Challeix, -/3/1948, No. 41; Anse Vata, -/3/1948, No. 62; Anse Vata, 8/7/1948, Nos. 133 and 156.

Geogr. Distr.: Mauritius, Ceyon, Malaya, Japan, Friendly Islands, etc., N. W. and S. Australia.

2. **Padina Pavonia** (*L.*) *Lamour. in Bory*, 1822-1831 (pt. 12), p. 589; De Toni, 1895, p. 243-244; *Fucus Pavonius* L., 1753, p. 1630.

New Caledonia: Anse Vata, -/2/1948, No. 1.

Geogr. Distr.: Atlantic and Indian Oceans, Mediterranean and Red Seas, Hawaii, Admiralty Islands, Fiji, N.E. and S. Australia.

Vaughaniella *Borgesen*

Vaughaniella rupicola *Borgs.,* 1950, p. 1-10, figs 1-10.

My specimens agree well with the original description and Dr. Borgesen has kindly examined some of my material and agrees with the identification.

In L.S. of the thallus the cells beneath the epidermis are seen to be in superimposed tiers. In my material also the near-apical cells described by Borgesen (loc. cit. p. 8-9) are further advanced and form a tuft of unbranched hairs, the cell contents of which are densely protoplasmic.

New Caledonia: Anse Vata, -/3/1948, No. 43.

Geogr. Distr.: Mauritius, N.E. Australia.

HETEROGENERATAE.

PUNCTARIALES.

Family ENCOELIACEAE.

Colpomenia *Derbes et Solier*

Colpomenia sinuosa (*Roth*) *Derb. et Sol.,* 1856, p. 11, pl. 22, figs. 18-20; Setchell & Gardner, 1925, p. 539-542, pl. 45. figs. 82-86; *Ulva sinuosa* Roth., 1806, p. 327, pl. 12.

New Caledonia: Anse Vata, 8/7/1948, No. 134; Anse Vata, -/7/1949, No. 297.

Geogr. Distr.: Mediterranean, Red and Adriatic Seas, Atlantic and Indian Oceans, Japan, all around Australia.

Hydroclathrus *Bory*

Hydroclathrus clathratus (*Bory*) *Howe,* 1920, p. 590; Setchell & Gardner, 1925, p. 543; *Fucus clathratus* Bory in Ag., 1823-1828.

New Caledonia: Anse Vata, -/3/1948, No. 56.

Geogr. Distr.: Widespread in tropical Atlantic and Pacific Oceans, Mediterranean and Red Seas, N. S. E. and W. Australia.

Chnoospora *J.Agardh*

Chnoospora obtusangula (*Harv.*) *Sond.,* 1871, p. 45; De Toni, 1895, p. 465; *Dictyota obtusangula* Harv., 1859, p. 329, n. 14.

Agrees with Harvey's Friendly Island Algae Exsicc. No. 4.

New Caledonia: Drift, Anse Vata, -/9/1948, No. 234.

Geogr. Distr.: Atlantic Ocean, Japan, Friendly Islands, N.E. Australia.

CYCLOSPOREAE.

FUCALES.

Family SARGASSACEAE.

Cystophyllum *J. Agardh*

Cystophyllum muricatum (*Turn.*) *J.Ag.,* 1848, p. 231; De Toni, 1895, p. 154; *Fucus muricatus* Turn., 1808-1819 (vol. 2), p. 108, tab. 112.

New Caledonia: Anse Vata, -/2/1948, Nos. 3 and 15; Anse Vata, -/3/1948, No. 57; Anse Vata, 5/6/1948, No. 111.

Geogr. Distr.: India, Admiralty Islands, etc., all around Australia.

Hormophysa *Kuetzing*

Hormophysa triquetra (*L.*) *Kuetz.*, 1843, p. 359; Borgs., 1939, p. 96; *Fucus triqueter* L., 1771, p. 312; *Cystoseira triquetra* (L.) J.Ag., 1848, p. 215.

Osborn (1948, p. 48) records that the Australian plant known as *Hormosira* (?) *articulata* (Forsk.), Zan. is in fact *Hormophysa triquetra.*

New Caledonia: Anse Vata, -/2/1948, Nos. 10 and 14; Anse Vata, -/3/1948, No. 49.

Geogr. Distr.: India, Red Sea, W., N. and E. Australia.

Sargassum *Agardh*

1. **Sargassum scabripes** *J.Ag.*, 1872, p. 52; 1889, p. 48, tab. 2.

New Caledonia: Anse Vata, -/2/1948, No. 4; Anse Vata, 5/6/1948, No. 100.

Geogr. Distr.: N. Australia.

2. **Sargassum flavicans** (*Mert.*) *Ag.*, 1823-1828, p. 18; J.Ag., 1889, p. 82-83, tab. 25 (3); *Fucus flavicans* Mert., 1819, p. 8.

It is probably this species, Mrs. Catala thinks, which grows at a depth of 6-12 meters off Ile aux Canards, on the side exposed to the wind.

New Caledonia: Anse Vata, 5/6/1948, Nos. 102, 105; Anse Vata, 16/6/1948, No. 106; Anse Vata, 9/7/1948, No. 180; Ile aux Canards, -/5/1949, No. 269.

Geogr. Distr.: W., N. and E. Australia.

3. **Sargassum fissifolium** (*Mert.*) *J.Ag.*, 1889, p. 83, tab. 25 (4); *Fucus fissifolium* Mert., 1819, p. 9.

Divided leaves are frequent in this species. Specimen No. 267 appears to be the form described and figured by J. Agardh (loc. cit.) while the other specimens here cited here have narrower leaves and receptacles which are somewhat longer and more branched. There is, however, no more variation in the shape of the receptacles than I have found in a single plant of the allied species, *S. flavicans* (Mert.) Ag., in which leaf width may vary also. Further, our specimen No. 267 shows much variation in receptacle shape; consequently I do not think these variations warrant taxonomic distinction.

New Caledonia: Anse Vata, -/3/1948, No. 47; Anse Vata, 5/6/1948, No. 103; Ile aux Canards, -/5/1949, Nos. 266, 267 and 270.

Geogr. Distr.: N.E. Australia.

4. **Sargassum** probably **Binderi** *Sond. in J.Ag.*, 1848, p. 328; J.Ag., 1889, p. 87-88, tab. 26 (2).

A distinctive species, but in the absence of fertile material the identification is left as problematical.

New Caledonia: Anse Vata, -/2/1948, No. 18; Anse Vata, -/3/1948, Nos. 58 and 60.

Geogr. Distr.: Indian Ocean, Norfolk Island, N. Australia.

5. **Sargassum lophocarpum** *J.Ag.*, 1889, p. 93, tab. 27 (2).

Sterile material (Nos. 11 and 16 from Anse Vata) is probably of this species also.

New Caledonia: Ile aux Canards, -/5/1949, No. 282.

Geogr. Distr.: N., S., E. and W. Australia.

6. **Sargassum (?) cinctum** *J.Ag.*, 1848, p. 324; 1889, p. 85, tab. 27 (3).

The single specimen is old and weathered.

New Caledonia: Region du Mont Dore, -/5/1949, No. 268.

Geogr. Distr.: Indian Ocean, N. Australia.

7. **Sargassum filifolium** *Ag.*, 1824, p. 305; J.Ag., 1889, p. 100, tab. 28 (5).

New Caledonia: Anse Vata, -/3/1948, No. 48.

Geogr. Distr.: W. and N.E. Australia.

8. **Sargassum stenophyllum** *J.Ag.*, 1848, p. 335; 1889, p. 104-105, tab. 29 (2).

This species appears to vary in degree of development of the pedicel bearing the receptacle.

New Caledonia: Anse Vata, 16/6/1948, No. 119; Ile aux Canards, -/5/1949, No. 265.

Geogr. Distr.: Norfolk Island, N. and W. Australia, Tasmania.

9. **Sargassum Desvauxii** (*Mert?*) *Ag.*, 1824, p. 305; J.Ag., 1889, p. 105-106, tab. 29 (4); *Fucus Desvauxii* Mert., 1819, p. 12.

New Caledonia: Ile aux Canards, -/5/1949, No. 275.

Geogr. Distr.: W., S. and N.E. Australia.

10. **Sargassum torvum** *J.Ag.*, 1889, p. 107-108, tab. 29 (5).

New Caledonia: Anse Vata, -/2/1948, No. 6; Anse Vata, -/3/1948, No. 55.

Geogr. Distr.: N.E. Australia.

11. **Sargassum polyacanthum** *J.Ag.*, 1889, p. 116, tab. 30 (5).

New Caledonia: Anse Vata, 5/6/1948, No. 109; Drift, Anse Vata, -/9/1949, No. 286.

Geogr. Distr.: S. and E. Australia.

Turbinaria *Lamouroux*

Turbinaria ornata *J.Ag.*, 1848, p. 266; De Toni, 1895, p. 128; *Fucus turbinatus* var. *ornatus* Turn., 1809-1819 (vol. 1), p. 50, tab. 24, figs. c-h.

New Caledonia: Anse Vata, -/3/1948, No. 65.

Geogr. Distr.: Ceylon, New Zealand, Andaman Islands, Friendly Islands, Admiralty Is., Samoa, etc., N. Australia.

MYXOPHYCEAE.

Family RIVULARIACEAE.

Calothrix (*Agardh*) *Bornet et Flahault*

1. **Calothrix aeruginea** *Born et Flah.*, 1886, p. 357.

New Caledonia: Pointe Challeix, -/3/1948, on *Padina Commersonii*, No. 41.

Geogr. Distr.: Widespread in warm seas; N., S. and W. Australia.

2. **Calothrix pilosa** *Born et Flah.*, 1886, p. 363.

New Caledonia: Ile aux Canards, 28/5/1949, No. 310.

Geogr. Distr.: Widespread in warm seas; N.E. Australia.

Dichothrix (*Zanardini*) *Bornet et Flahault*

Dichothrix penicillata *Born. et Flah.*, 1886, p. 379.

New Caledonia: Anse Vata, 8/7/1948, on *Padina Commersonii*, No. 133.

Geogr. Dist.: Red Sea, Jamaica, Mexico, Guadelupe, etc.

Family OSCILLATORIACEAE.

Hydrocoleum (*Kuetzing*) *Gomont*

Hydrocoleum glutinosum *Gom.*, 1892 (Part 15), p. 339.

New Caledonia: Anse Vata, 9/3/1948, No. 161; Ile aux Canards, -/9/1949, No. 299. Epiphytic.

Geogr. Distr.: Widespread.

Symploca (*Kuetzing*) *Gomont*

Symploca hydnoides *Gom.*, 1892 (Part 16), p. 106.

New Caledonia: Anse Vata, -/3/1948, on *Enteromorpha intestinalis*, No. 39; Ile aux Canards, -/3/1948, Nos. 167 and 168; Ilot Tilguit, 15/8/1948, No. 206.

Geogr. Distr.: Widespread.

Lyngbya (*Agardh*) *Gomont*

Lyngbya majuscula *Gom.*, 1892 (Part 16), p. 131, pl. 3, figs. 3 and 4.

New Caledonia: Anse Vata, 17/6/1948, No. 127; Anse Vata, -/9/1949, No. 298; Reef Ricaudy, 6/6/1949, No. 258; Ile aux Canards, -/9/1949, No. 305, Epiphytic; Ilot du Grand Mato, 18/5/1950, No. 325.

Geogr. Distr.: Widespread; N.E. Australia.

RHODOPHYCEAE.

FLORIDEAE.

NEMALIONALES.

Family BONNEMAISONIACEAE.

Asparagopsis *Montagne*

Asparagopsis armata *Harv.*, 1855, p. 544; De Toni, 1924, p. 367-368.

New Caledonia: Reef Ricaudy, 6/6/1949, No. 259.

Geogr. Distr.: New Zealand, all around Australia.

Family HELMINTHOCLADIACEAE.

Trichogloea *Kuetzing*

Trichogloea lubrica (*Harv.*) *J.Ag.*, 1876, p. 514; De Toni, 1924, p. 78; *Liagora lubrica* Harv., Friendly Islands Algae Exsicc. No. 46; in J.Ag., 1876, p. 514.

As is pointed out by Papenfuss (1946, p. 420), the recognised range of this species is more limited than was originally recorded.

New Caledonia: Region de Tiare, 30/10/1948, No. 239.

Geogr. Distr.: Friendly Islands, ? West Indies.

Liagora *Lamouroux*

1. **Liagora annulata** *J.Ag.*, 1876, p. 518; De Toni, 1924, p. 91.

NEW CALEDONIA: Anse Vata, 8/7/1948, Nos. 138 and 144.

GEOGR. DIST.: West Indies and warm Pacific Ocean, N.E. Australia.

2. **Liagora ceranoides** *Lamour.*, 1816, p. 239; Borg., 1939, p. 104; *Liagora leprosa*, J.Ag., 1847, p. 8.

NEW CALEDONIA: Anse Vata, -/2/1948, No. 27; Reef Ricaudy, -/7/1948, No. 190; Ilot Tilguit, 15/8/1948, No. 213.

GEOGR. DISTR.: West Indies, Red Sea, Mauritius, Indian Ocean, Malayan Archipelago, Japan, etc., N.E. Australia.

3. **Liagora rugosa** *Zan.*, 1851, p. 36.

Var. **Viellardii** *Grun.*, 1874, p. 36; De Toni, 1897-1905 (Part 1), p. 96.

This specimen shows more dichotomy in branching and is larger than some material similarly labelled (Herb. N.S.W., det. A.H.S. Lucas) obtained from Norfolk Island, where this variety has been previously recorded. Ours may be a different variety, but on a single collection it seems wiser to leave it as identified above.

NEW CALEDONIA: Ile aux Canards, -/5/1949, No. 276.

GEOGR. DISTR.: Friendly and Norfolk Islands.

Family CHAETANGIACEAE.

Galaxaura *Lamouroux*

1. **Galaxaura fasciculata** *Kjellm. emend. Chou,* 1944, p. 44-45, pl. 2, fig. 2, pl. 8, fig. 1.; Kjellm., 1900, p. 53, pl. 5, figs. 1-9, pl. 20, fig. 14.

NEW CALEDONIA: Anse Vata, -/12/1948, No. 22.

GEOGR. DISTR.: Japan, Celebes, Philippine Islands, Malayan Archipelago, Friendly Islands, N.E. Australia.

2. **Galaxaura fastigiata** *Decne.*, 1842, p. 116; Svedelius, 1945, p. 28-32, fig. 14-15.

Specimen No. 121 was kindly identified for me by Professor Nils Svedelius.

NEW CALEDONIA: Anse Vata, 16/6/1948, No. 121.

GEOGR. DIST.: Japan, Ceylon, Philippines, Polynesia, Malay Archipelago, Mauritius, Mexican Gulf, Red Sea, N. Australia.

3. **Galaxaura oblongata** (*Ellis et Sol.*) *Lamour. emend. Chou,* 1945, p. 7-9, pl. 2, figs. 1-6, pl. 3, figs. 1-14, pl. 9, figs. 1-2; Lamour., 1816, p. 262; *Corallina oblongata* Ellis et Sol., 1786, p. 114, pl. 22, fig. 1.

Specimen No. 277 was kindly identified for me by Professor Nils Svedelius.

NEW CALEDONIA: Anse Vata, 17/6/1948, No. 123; Ile aux Canards, -/5/1949, No. 277.

GEOGR. DISTR.: West Indies, Mexico, Florida, Philippine Islands, Java, Japan, Adriatic and Red Seas, etc., N. Australia.

4. **Galaxaura glabriuscula** *Kjellm. emend. Chou,* 1945, p. 11-13, pl. 4, figs. 14-20, pl. 10, fig. 1; Kjellm., 1900, p. 56-77, pl. 7, figs. 1-2, pl. 20, fig. 26.

NEW CALEDONIA: Ilot Tilguit, 15/8/1948, No. 218.

GEOGR. DISTR.: Tahiti, Java, Hawaii, Bonin Islands, N.E. Australia.

5. **Galaxaura ventricosa** *Kjellm. emend. Chou,* 1945, p. 18-19, pl. 6. figs. 9-12, pl. 12, fig. 2; Kjellm., 1900, p. 81, pl. 16, figs. 11-16, pl. 20. fig. 24.

As shown by Chou (loc. cit.) this species is very close to *G. veprecula,* and the distribution of the species suggests that the present collection might represent aberrant specimens of that species; however, the spinulose cells are definitely localised on the thallial margins and the thallus width (slightly over 2 mm.) and shape also show that the specimen should indeed be labelled as *G. ventricosa.*

NEW CALEDONIA: Ilot Tilguit, 15/8/1948, No. 217.

GEOGR. DISTR.: Africa, Mexico.

GELIDIALES.

Family GELIDIACEAE.

Gelidiella *Feldmann et Hamel*

Gelidiella acerosa (*Forsk.*) *Feldm. et Hamel,* 1934, t. 46, p. 533; Borg., 1939, p. 107; *Fucus acerosus* Forsk., 1775, p. 190.

NEW CALEDONIA: Ile aux Canards, 16/6/1938, No. 120; Ile aux Canards, -/3/1948, No. 171; Anse Vata, 9/7/1948, No. 175; Anse Vata, -/7/1949, No. 293; Reef Ricaudy, -/7/1948, No. 196.

GEOGR. DISTR.: Warm seas generally; N.E. Australia.

Pterocladia *J. Agardh*

Pterocladia capillacea (*Gmel.*) *Born.,* 1876, p. 57, t. 20, figs. 1-7; Okamura, 1907-1937 (vol. 3), p. 50, tab. 115; *Fucus capillaceus,* Gmel., 1768, p. 146, t. 15, fig. 1.

NEW CALEDONIA: Region de Tiare, 30/10/1948, No. 236. A poor specimen.

GEOGR. DISTR.: Europe in Mediterranean and Atlantic waters, Japan, Norfolk Island, E., W. and S. Australia.

CRYPTONEMIALES.

Family GRATELOUPIACEAE.

Zanardinula *De Toni*

Zanardinula obtusa (*Sond.*) *n. comb.; Prionitis obtusa* Sond., 1871, p. 63-64, pl. 2, figs. 7-9; De Toni, 1897-1905, (pl. 4), p. 1593. The generic name is here changed from *Prionitis* to *Zanardinula,* following De Toni (1936).

Sonder (loc. cit.) described and figured this species as *Prionitis obtusa,* collected from Cape York by Daemel. His material, unfortunately, was sterile.

The thallus of the present collection accords with Sonder's original figures 7-9. In addition some branches are constricted at their bases. Sonder's fig. 8 has been criticised as showing a parenchymatous tissue representing better a *Gracilaria* or *Melanthalia,* but in fact the medulla is dense and composed of slender filaments with coalesced walls. Although some sections can be obtained which accord with Sonder's fig. 8 (except that the cells of the central tissue have relatively narrower lumina), other sections show cells more loosely packed, so that the filamentous structure can be seen quite clearly. Outside this medulla are larger filaments which appear parenchymatous in T.S., and the outer cortex consists of smaller filaments, cells of which appear rectangular in T.S.

The present collection is cystocarpic and is, therefore, of special interest, being, I think, the first fertile material known of this species. Cystocarps are scattered on the branches, occurring frequently on the lateral proliferations (both surfaces); they are small, immersed, and accord with those of other species of this genus.

Polyopes ? ligulatus (Harv.) J.Ag. (Harv. Alg. Ceylon Exsicc. No. 50) suggests strongly the present species when judged on vegetative characters. It was compared with the present species by Sonder in his original description of the species. Further, under the name of *Grateloupia emarginata* Kuetz. (linked as a synonym by J. Agardh, 1876, p. 163), this species has been recorded from New Caledonia (De Toni, 1897-1905 (part 4), p. 1596). However, J. Agardh (1876, p. 162) speaks of fertile tetrasporic material occurring in *P. ligulatus* near the apices of the branches (typical of the genus *Polypes*) while in *Z. obtusa* the only fertile material known (i.e., that just recorded) is cystocarpic, the cystocarps occurring scattered on the lateral proliferations and also on the ordinary branches, typical of the genus *Zanardinula.* Thus on present evidence these two very similar species must be regarded as generically distinct.

New Caledonia: Region de Baye, 16/8/1948, No. 222.

Geogr. Distr.: Samoan Archipelago, N. Australia.

Family RHIZOPHYLLIDACEAE.

Desmia *Lyngbye*

Desmia Kilneri *J.Ag.,* 1876, p. 335; *Chondrococcus Kilneri* (J.Ag.) De Toni, 1897-1905 (pt. 4), p. 1676.

Papenfuss (1940, p. 218) discusses the use of the generic name *Desmia* in preference to *Chondrococcus.*

This unusual plant was found fortunately bearing cystocarps (No. 176); these accord with the illustration of *D. Hornemanni* (Mert.) Schmitz by J. Agardh (1879, t. 21, figs. 9-10).

New Caledonia: Anse Vata, -/3/1948, No. 68; Anse Vata, 9/7/1948, No. 176; Ilot Tilguit, 15/8/1948, No. 201.

Geogr. Distr.: N. Australia.

Family CORALLINACEAE.

Lithothamnion *Philippi*

? **Lithothamnion** species.

A sterile specimen, No. 340, collected at Ilot du Grand Mato, 18/5/1950, appears similar to specimens of *Lithothamnion australe* Forsk.

A further sterile specimen, No. 187, somewhat coarser than the above, is also probably a species of *Lithothamnion;* it was collected at Reef Ricaudy, 20/7/1948.

Goniolithon *Foslie*

Goniolithon Fosliei (*Heydr.*) *Fosl.,* 1903, p. 470, t. 25, f. 3; W. v. B. et Foslie, 1904, p. 46-48, fig. 19, pl. 9., figs. 1-5; (*Lithothamnion Fosliei*) Heydr., 1897, p. 58, ex parte.

No. 339 is tetrasporic.

New Caledonia: Ilot du Grand Mato, 18/5/1950, Nos. 339 and 344.

Geogr. Distr.: Maldive and Laccadive Islands, Red Sea, Zanzibar, Malayan Archipelago; Murray Island, N. Australia.

Fosliella *Howe*

Fosliella farinosa (*Lamour.*) *Howe,* 1920; *Melobesia farinosa* Lamour., 1816, p. 315, tab. 12, fig. 3.

New Caledonia: Anse Vata, -/3/1948, on *Sargassum* sp. No. 59.

Geogr. Distr.: Widespread; N., S., E. and W. Australia.

Lithophyllum *Philippi*

Lithophyllum sp.

An incomplete specimen of what is probably a *Lithophyllum* sp. was collected at Reef Ricaudy, 20/7/1948, No. 187 (bis).

Amphiroa *Lamouroux*

1. **Amphiroa fragilissima** (*L.*) *Lamour.*, 1816, p. 298; De Toni, 1924, p. 701; W. v. B. et Foslie, 1904, p. 89-91, pl. 61, figs. 1, 2, 5. *Corallina fragilissima* L., 1765, p. 1305.

New Caledonia: Reef Ricaudy, 6/6/1949, No. 255.

Geogr. Distr.: Widely distributed in warm seas; N.E. Australia.

2. **Amphiroa foliacea** *Lamour. in Freyc.*, 1824-1826, p. 628, t. 93, f. 2-31; W. v. B. et Foslie, 1904, p. 92-93, tab. 14, figs. 1-11.

New Caledonia: Ilot du Grand Mato, 18/5/1950, No. 341.

Geogr. Distr.: India, Malaya, Marianas, ? N.E. Australia.

Cheilosporum (*Decaisne*) *Areschoug*

Cheilosporum spectabile *Harv.*, Friendly Is. Alg. No. 31; in Grun., 1874, p. 41; De Toni, 1924, p. 705.

New Caledonia: Region de Baye, 16/8/1948, No. 223.

Geogr. Distr.: Pacific Ocean Islands, N.E. Australia.

Jania *Lamouroux*

Jania rubens (*L.*) *Lamour.*, 1816, p. 272; De Toni, 1924, p. 709; *Corallina rubens* L., 1765, p. 1305.

Agrees with Harvey's Alg. Exciss. Friendly Is. No. 30. This species occurred frequently as an epiphyte.

New Caledonia: Anse Vata, -/3/1948, No. 75; Ile aux Canards, -/5/1949, No. 271.

Geogr. Distr.: Temperate and warm seas, Lord Howe Island., N., E. and S. Australia.

GIGARTINALES.

Family NEMASTOMACEAE.

Titanophora *Borgesen*

Titanophora Weberae *Borgs.*, 1943, p. 36-39, fig. 13; 1949, p. 4; *Platoma Pikeana* W. v. B., 1913-1928, p. 253-255, figs. 80-83.

This species apparently has been collected only once previously. It is discussed in some detail by Borgesen (loc. cit., 1943). My specimen accords well with the description and figure; it bears gonimoblasts.

New Caledonia: Ilot Tilguit, 15/8/1948, No. 212.

Geogr. Distr.: New Guinea.

Family SOLIERIACEAE.

Eucheuma *J. Agardh*

Eucheuma speciosum (*Sond.*) *J.Ag.*, 1852-1863, p. 628; W. v. B., 1913-1928, p. 412. *Gigartina speciosa* Sond., 1845, p. 55.

New Caledonia: Ilot du Grand Mato, 18/5/1950, No. 329.

Geogr. Distr.: Maurice Is., S.W. Australia and Tasmania.

Family RHODOPHYLLIDACEAE.

Gelidiopsis *Schmitz*

1. **Gelidiopsis acrocarpa** (*Harv.*) *Schmitz,* 1895, p. 148; De Toni, 1924, p. 245; *Gelidium acrocarpum* Harv. in J.Ag., 1876, p. 552.

New Caledonia: Anse Vata, -/3/1948, No. 69; Anse Vata, 9/7/1948, No. 178, Region de Baye, 16/8/1948, No. 221; Mont Dore, -/4/1950, No. 319.

Geogr. Distr.: Africa, Japan, Ceylon, Friendly Islands, N. Australia.

2. **Gelidiopsis intricata** (*Ag.*) *Vickers,* 1905, p. 61; Borg., 1943, p. 53-54; *Sphaerococcus intricata* Ag., 1823-1828, p. 333.

New Caledonia: Ilot Signal, -/7/1948, No. 199; Reef Ricaudy, 6/6/1949, No. 260.

Geogr. Distr.: Indian and Pacific Oceans, West Indies, N. Australia.

Family HYPNACEAE.

Hypnea *Lamouroux*

1. **Hypnea Esperi** *Bory,* 1828, p. 157; Tanaka, 1941, p. 243, fig. 15.

New Caledonia: Ile aux Canards, -/5/1949, Nos. 264 and 281; Ile aux Canards, -/9/1949, No. 311.

Geogr. Distr.: Brazil, Chili, Pacific Ocean; Australia (no further detail given by Tanaka, loc. cit.).

2. **Hypnea Valentiae** (*Turn.*) *Mont.,* 1840, p. 161; Hauck, 1887, p. 20; Borg., 1934,* p. 17-18; 1943, p. 58-59; *Fucus Valentiae* Turn., 1808-1819, pl. 78; *Hypnea charoides* Lamour., 1813, p. 44, pl. 10, figs. 1-3; Tanaka, 1941, p. 243-244, fig. 16; Borg., 1943, p. 56-58; *Hypnea seticulosa* J.Ag., 1852-1863.

Borgesen (1943, p. 58) says that the absence of stellate bulbils in material from Mauritius was his reason for keeping *H. charoides* separate from *H. Valentiae.* The New Caledonian material also lacks stellate bulbils, but Australian collections indicate that there is no break between the forms which bear these bulbils and the forms which do not. Hence I follow Hauck (1887, p. 20) and include *H. charoides* among the synonyms of *H. Valentiae.*

Most Australian records of this species are under the name of *H. seticulosa* J.Ag.

New Caledonia: Anse Vata, -/3/1948, No. 36; Reef Ricaudy, 6/6/1949, No. 250.

Geogr. Distr.: Indian Ocean, Japan, S. Pacific; all around Australia.

3. **Hypnea cenomyce** *J.Ag.,* 1852-1863, p. 452; Tanaka, 1941, p. 250, fig. 21. Specimens Nos. 140 and 215 were kindly checked by Dr. Tore Levring against original Agardh material now in Lund.

New Caledonia: Anse Vata, 8/7/1948, No. 140; Anse Vata, 9/7/1948, No. 179; Ilot Tilguit, 15/8/1948, No. 215.

Geogr. Distr.: Japan, Lord Howe Island. W., N. and E. Australia and Tasmania.

Family PLOCAMIACEAE.

Plocamium (*Lamouroux*) *Lyngbye*

Plocamium leptophyllum *Kuetz.,* 1849, p. 885; De Toni, 1897-1905, p. 589.
New Caledonia: Reef Ricaudy, 20/7/1948, No. 184.

Geogr. Distr.: All around Australia.

Family GRACILARIACEAE.

Gracilaria *Greville*

Gracilaria lichenoides (*L. in Turn.*) *Harv.*, 1844, p. 445; *Fucus lichenoides* L. in Turn., 1808-1819, tab. 118A (excl. var. and synon.).

f. **taenioides** (*J.Ag.*) *May*, 1948, p. 30-31; *Gracilaria taenioides* J.Ag., 1852-1863, p. 593.

In addition to the specimens quoted, there were also small amounts of this species present as epiphytes on various specimens from Anse Vata.

New Caledonia: Ile aux Canards, -/3/1948, No. 170; Anse Vata, 8/7/1948, No. 157; Anse Vata, 9/7/1948, No. 182; Reef Ricaudy, -/9/1948, No. 231.

Geogr. Distr.: Warm Pacific and East Indian Oceans, N. and E. Australia.

Corallopsis *Greville*

Corallopsis minor (*Sond.*) *J.Ag.*, 1876, p. 409; De Toni, 1897-1905 (Pt. 1), p. 459. *Corallopsis salicornia* var. *minor* Sond., 1871, p. 24, t. 3, f. 6-11.

Specimens Nos. 252, 253 are rather larger than is usual for this species.

New Caledonia: Anse Vata, 8/7/1948, No. 142; Reef Ricaudy, 6/6/1949, Nos. 252 and 253.

Geogr. Distr.: Marianas Islands, N. Australia.

Ceratodictyon *Zanardini*

Ceratodictyon spongiosum *Zan.*, 1878, n. 8; De Toni, 1924, p. 243.

New Caledonia: Anse Vata, 8/7/1948, No. 132.

Geogr. Distr.: Warm Pacific and Indian Oceans, N.E. Australia.

CERAMIALES.

Family CERAMIACEAE.

Ceramium (*Roth*) *Lyngbye*

Ceramium gracillimum *Griff. et Harv.* in Harv., 1846-1851, t. 206; De Toni, 1924, p. 515.

This species has also been found on other New Caledonian specimens, growing epiphytically.

New Caledonia: Ilot du Grand Mato, 18/5/1950, Nos. 332 and 334.

Geogr. Distr.: Atlantic Ocean, Mediterranean and Adriatic Seas, West Indian Ocean, Japan, etc., N., E. and S. Australia and Tasmania.

Centroceras *Kuetzing*

Centroceras clavulatum *Mont.*, 1840-1850, p. 140; Feldmann-Mazoyer, 1940, p. 337-341, figs. 128-129.

New Caledonia: Ilot Tilguit, 15/8/1948, No. 208.

Geogr. Distr.: Mediterranean and Adriatic Seas, Atlantic and Pacific Oceans; all around Australia.

Spyridia *Harvey*

Spyridia filamentosa (*Wulf.*) *Harv. in Hook.*, 1833, p. 336; Feldmann-Mazoyer, 1940, p. 348-351, fig. 133; *Fucus filamentosus* Wulf., 1803, p. 64.

New Caledonia: Anse Vata, -/3/1948, No. 33; Reef Ricaudy, -/7/1948, No. 194; Ilot du Grand Mato, 18/5/1950, No. 326.

Geogr. Distr.: Atlantic coasts of Europe, Africa and America, Mediterranean and Red Seas, Indian Ocean, Japan, N., S. and E. Australia and Tasmania.

Family DELESSERIACEAE.

Mesotrema *J. Agardh*

Mesotrema elegans (*Hering*) *Pap.*, 1942, p. 449; *Martensia elegans* Hering, 1841, p. 92.

New Caledonia: Ilot du Grand Mato, 18/5/1950, No. 322.

Geogr. Distr.: Africa, S., E. and W. Australia.

Family DASYACEAE.

Dasya *Agardh*

Dasya sp.

A distinctive species, but not yet found fertile. The plant is dendroid, up to 3 cm. high, bears dichotomous monisiphonous hairs from near the apex, has five pericentral cells and is much corticated.

New Caledonia: Anse Vata, 17/6/1948, No. 122; Anse Vata, 9/7/1948, No. 177.

Geogr. Distr.: N. and E. Australia.

Family RHODOMELACEAE.

Polysiphonia *Greville*

Polysiphonia sp.

A dark coloured specimen with seven pericentral cells and bearing ephemeral hairs near apex.

New Caledonia: On boat, -/3/1948, No. 162.

Digenea *Agardh*

Digenea simplex (*Wulf.*) *Ag.*, 1823-1828, p. 389; De Toni, 1924, p. 404; *Conferva simplex* Wulf., 1803, p. 17, n. 16.

Taylor (1945, p. 297) points out that "Both the De Toni and Engler-Prantl descriptions of this genus indicate that the maximum number of pericentral cells in the lateral branches is 8, but examination of the I. Soccoro (Mexico) material showed most commonly 9 or 10." The New Caledonian material showed 9 pericentral cells.

New Caledonia: Anse Vata, -/2/1948, No. 12.

Geogr. Distr.: Most warm seas; N. and W. Australia.

Roschera *Sonder*

Roschera glomerulata (*Ag.*) *W. v. B.*, 1914, p. 289; De Toni, 1924, p. 404-405. *Tolypiocladia glomerulata* (Ag.) Schmitz. in Engl. & Prantl., 1897, p. 442. *Hutchinsia glomerulata* Ag., 1823-1828, p. 102.

New Caledonia: Ile aux Canards, -/3/1948, No. 172; Ilot Tilguit, 15/8/1948, No. 207; Reef Ricaudy, -/9/1948, No. 229; Drift, Anse Vata, 2/10/1949, No. 312; Ilot du Grand Mato, 18/5/1950, No. 335.

Geogr. Distr.: East Africa, West Indies, Ceylon, Japan, Friendly and Philippine Islands, New Zealand, etc., N. Australia.

Bostrychia *Montagne*

Bostrychia tenella (*Vahl.*) *J.Ag.*, 1852-1863, p. 869; Post, 1936, p. 25-28; *Fucus tenella* Vahl., 1802, p. 45.

New Caledonia: Ile aux Canards, -/9/1949, No. 300.

Geogr. Distr.: Warm seas generally; N. Australia.

Leveillea *Decaisne*

Leveillea jungermannioides (*Mart. et Hering*) *Harv.*, 1855, p. 539; Borg., 1939, p. 132; *Amansia jungermannioides* Mart. et Hering in Mart., 1836, p. 485.

NEW CALEDONIA: Anse Vata, -/3/1948, on *Sargassum* probably *Binderi*, No. 60.

GEOGR. DISTR.: Red Sea, Indian Ocean, Japan, Norfolk Island, W. and N.E. Australia.

Amansia *Lamouroux*

Amansia glomerata *Ag.*, 1824, p. 247; De Toni, 1924, p. 426.

NEW CALEDONIA: Ilot Tilguit, 15/8/1948, No. 205.

GEOGR. DISTR.: Warm Pacific and Indian Oceans, N.E. Australia.

Neurymenia *J. Agardh*

Neurymenia fraxinifolia (*Mert.*) *J.Ag.*, 1852-1863, p. 1135; Borg., 1945, p. 46-47; *Fucus fraxinifolius* Mert. in Turn., 1808-1819, pl. 193.

NEW CALEDONIA: Region de Baye, 16/8/1948, No. 224.

GEOGR. DISTR.: Indian Ocean, Japan, W. and N.E. Australia.

Laurencia *Lamouroux*

1. **Laurencia obtusa** (*Huds.*) *Lamour.*, 1813, p. 42; De Toni, 1924, p. 371; *Fucus obtusus* Huds., 1778, p. 586.

This seems to be a prevalent species of rather varying habit.

NEW CALEDONIA: Anse Vata, -/2/1948, Nos. 7, 21; Anse Vata, -/3/1948, No. 32; Anse Vata, 16/1/1948, No. 112; Anse Vata, 8/7/1948, No. 151; Ile aux Canards, -/3/1948, No. 159; Reef Ricaudy, 20/7/1948, Nos. 185, 188; Drift, Anse Vata, -/9/1948, No. 232; Reef Ricaudy, 6/6/1949, No. 284.

GEOGR. DISTR.: Widespread in warm seas; all around Australia.

2. **Laurencia Brongniartii** *J.Ag.*, 1841, p. 20; Yamada, 1931, p. 240-241, pl. 25, fig. a.b; *Laurencia concinna* Mont., 1842, p. 6; De Toni, 1897-1905 (pt. 3), p. 806.

NEW CALEDONIA: Anse Vata, -/3/1948, Nos. 37, 46; Anse Vata, 16/6/1948, No. 116; Reef Ricaudy, -/7/1948, No. 189; Ile aux Canards, 7/8/1949, No. 315; Ilot du Grand Mato, 18/5/1950, No. 342.

GEOGR. DISTR.: Africa, Lord Howe Island, W. and N. Australia.

Acanthophora *Lamouroux*

Acanthophora spicifera (*Vahl.*) *Borg.*, 1910, p. 201, figs. 18-19; 1945, p. 61; *Fucus spiciferus* Vahl, 1802, p. 44.

NEW CALEDONIA: Anse Vata, -/3/1948, No. 42; Anse Vata, 8/7/1948, No. 139; Reef Ricaudy, 6/6/1949, No. 254.

GEOGR. DISTR.: Widespread in tropical seas; N.E. Australia.

Chondria *Harvey*

Chondria sp.

I have insufficient comparative material to determine the species in this genus.

NEW CALEDONIA: Anse Vata, 16/6/1948, Nos. 114 and 115; Anse Vata, 9/7/1948, No. 181; Reef Ricaudy, -/9/1948, No. 235.

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SYNOPSIS.

The marine flora of New Caledonia recorded in this paper comprises 37 species of Chlorophyceae, 29 of Phaeophyceae, 6 of Myxophyceae and 50 of Rhodophyceae.

This flora is compared by means of a table with floras of relatively nearby islands, the greatest similarity being found with the flora of Brampton Island, Great Barrier Reef, Queensland, Australia.

◆

A Census of the Native Gramineae of New South Wales

JOYCE W. VICKERY, M.Sc.

The last comprehensive census of N.S.W. plants was that published by Maiden and Betche in 1916. These authors incorporated a number of alterations in nomenclature necessitated since the publication of the standard floras, Bentham's Flora Australiensis (1863-1878) and Moore and Betche's Handbook of the Flora of New South Wales (1893). Since its publication Maiden and Betche's Census of New South Wales Plants has apparently been adopted as the standard for native plant names by most non-systematic workers of this State, who all too seldom seek more recent information.

Critical systematic and nomenclatural studies since that time have inevitably revealed numerous errors in the Census, and many new species and records must be added to the list. The need for a completely new Census, and better still, a new Flora of the State is urgently felt by all students of New South Wales plants, and work is progressing towards that end. However, so much investigational work remains to be done that it is felt that the time is not yet ripe for the production of a comprehensive Census, which at this juncture would inevitably perpetuate many errors not yet investigated. Meanwhile, it is the intention of the staff of the National Herbarium to publish from time to time lists of corrections to, additions to and deletions from Maiden and Betche's Census of N.S.W. Plants, whenever current work indicates the necessity. It is hoped that these will provide a temporary source of information to the many who are interested but who have not ready access to the records accumulated in the National Herbarium.

The present list is intended as the first contribution of this nature, and has been prepared in its existing form for that purpose. No attempt has been made to give any exhaustive synonymy, but certain synonyms have been included only with the object of allowing the student to link up names in present use with those previously adopted in the New South Wales literature, so that both may be more readily comprehensible.

While in general the projected lists may touch only on particular species or genera of various families, the present list of the Gramineae has been made as complete as practicable. In this family it was found that some 80% of the species required inclusion either as corrections, additions or deletions. It seemed, therefore, that the list would be more generally useful if the remaining 20% were also included so that a complete Census of the native grasses at present known in this State would be provided. Future work will undoubtedly necessitate further amendments.

In this list, actual synonyms of the name adopted are preceded by the abbreviation "Syn." Where names have been incorrectly applied to the species in question, as a result of misidentification, they are preceded by the word "Vice" (i.e., instead of); these are not synonyms from the nomenclatural standpoint. In referring to illustrations of the species which have been published under another name not otherwise mentioned in the synonymy, the latter name is preceded by the word "sub."

Family GRAMINEAE.

Imperata *Cyr.*

I. cylindrica (*L.*) *Beauv.* var. **major** (*Nees*) *C. E. Hubbard* in Hubbard et Vaughan, Grasses of Mauritius and Rodriguez, (1940), 96. Figd. Agric. Gaz. N.S.W., IV (1893), 2; Turner, Austral. Grasses, (1895), 30.

Vice *I. arundinacea* Cyr.

Eulalia *Kunth.*

E. fulva (*R.Br.*) *Kuntze* in Rev. Gen., (1891), 775. Figd. by Grasse Agric. Gaz. N.S.W., II (1891), [illegible] 373; Turner, Austral. Grasses, (1895), 47, sub *Pollinia fulva.*

Syn.: *Erianthus fulvus* (R. Br.) Kunth.

Apluda L.

A. mutica L. Delete. There is no authentic evidence that this is a native of N.S.W. The figure in Agric. Gaz. N.S.W., X (1899), 1257 was doubtless prepared from an exotic specimen.

Ischaemum *L.*

I. australe *R. Br.,* Prodr., (1810), 205. Figd. Agric. Gaz. N.S.W., XVI (1905), 545.

I. triticeum *R. Br.,* Prodr., (1810), 205. Figd. Agric. Gaz. N.S.W., XVI (1905), 185.

I. ciliare Retz. Delete. Not known from N.S.W. The identity of the specimen cited by Bentham in Fl. Austral., VII (1878), 520, seems uncertain.

Sehima *Forsk.*

S. nervosum (*Rottl.*) *Stapf* in Prain, Fl. Trop. Afr., IX (1917), 36. Figured in Agric. Gaz. N.S.W., II (1891), 379, and in Turner, Austral. Grasses, (1895), 32.

Vice *Ischaemum laxum* R. Br.

Eremochloa *Buse.*

E. bimaculata *Hack.* in DC., Monog. Phan., VI (1889), 265. Figd. Agric. Gaz. N.S.W., XVI (1905), 430.

Vice *E. muricata* Hack.

Bothriochloa *O. Kuntze.*

B. erianthoides (*F. Muell.*) *C. E. Hubbard* in Kew Bull., (1934), 444. Figd. Agric. Gaz. N.S.W., II (1891), 377; Breakwell, Grasses and Fodder Pl. N.S.W. (1923), 207.

Syn.: *Andropogon erianthoides* F. Muell.

B. decipiens (*Hack.*) *C. E. Hubbard* in Kew Bull., (1934), 444. Figd. Agric. Gaz. N.S.W., IV (1893), 82. The figures in Agric. Gaz. N.S.W., II (1891), 239, and in Turner, Austral. Grasses, (1895), 3, sub *Andropogon affinis,* probably represent the non-pitted form of this species.

Vice *Andropogon pertusus* Willd.

B. ambigua *S. T. Blake* in Univ. Qld. Papers, Dept. Biol., II, No. 3 (1944), 29.

B. biloba *S. T. Blake,* l.c., 27.

B. intermedia (*R. Br.*) *A. Camus* in Ann. Soc. Linn. Lyon., n.s. LXXVI (1931), 164.

Vice *Andropogon punctatus* Roxb. The figure in Agric. Gaz. N.S.W., III (1892), 948, represents *Capillipedium spicigerum.*

B. ewartiana (*Domin*) *C. E. Hubbard* in Kew Bull., (1934), 444.

Hemarthria *R. Br.*

H. uncinata *R. Br.,* Prodr., (1810), 207. Figd. Agric. Gaz. N.S.W., III (1892), 539; Turner, Austral. Grasses, (1895), 28.
VICE *H. compressa* R. Br.

Arthraxon *Beauv.*

A. hispidus (*Thunb.*) *Makino* in Bot. Mag. Tokyo, XXVI (1912), 214. Based on *Phalaris hispida* Thunb. (1784).
VICE *A. ciliaris* Beauv. (1912), var. *australe* Benth.

Sorghum *Moench.*

S. halepense (L.) Pers., Syn., I (1805), 101. Figd. Agric. Gaz. N.S.W., VII (1896), 78; Maiden, Manual of the Grasses of N.S.W., (1898), 87.
DELETE from list of native grasses. Naturalised.

S. leiocladum (*Hack.*) *C. E. Hubbard* in Hook Ic. Pl. XXXIV (1938), t. 3364. Figd. Agric. Gaz. N.S.W., I (1890), 311, and l.c. III (1892), 3; Turner, Austral. Grasses, (1895), 49.
VICE *S. plumosum* (R. Br.) Beauv.

Schizachyrium *Nees.*

S. obliquiberbe (*Hack.*) *A. Camus* in Ann. Soc. Linn. Lyon., n.s. LXX (1923), 89. Figd. Agric. Gaz. N.S.W., XX (1909), 1084.
VICE *Andropogon brevifolius* Swartz.

Capillipedium *Stapf.*

C. parviflorum (*R. Br.*) *Stapf* in Prain, Fl. Trop. Afr., IX (1917), 169.
SYN.: *Chrysopogon parviflorus* (R. Br.) Benth.

C. spicigerum *S. T. Blake* in Univ. Qld. Papers, Dept. Biol., II, No. 3 (1944), 43. Figd. Agric. Gaz. N.S.W., VI (1895), 734, and Maiden, Manual of the Grasses of N.S.W., (1898), 85, sub *Chrysopogon parviflorus;* also in Agric. Gaz. N.S.W., III (1892), 948, and Turner, Austral. Grasses, (1895), 5 sub *Andropogon intermedius.*

Vetiveria *Thouars ex Virey.*

V. filipes (*Benth.*) *C. E. Hubbard* in Kew Bull., (1934), 444.

Chrysopogon *Trin.* Nomen conservandum.

C. fallax *S. T. Blake* in Univ. Qld. Papers, Dept. Biol., II, No. 3 (1944), 9. Figd. Agric. Gaz. N.S.W., XI (1900), 852.
VICE *C. Gryllus* Trin.

C. sylvaticus *C. E. Hubbard* in Hook Ic. Pl., XXXIV (1938), t. 3365.

Dichanthium *Willem.*

D. sericeum (*R. Br.*) *A. Camus* in Bull. Mus. Hist. Nat. Paris, XXVII (1921), 549. Figd. Agric. Gaz. N.S.W., I (1890), 309, and l.c. II (1891), 717; Breakwell, Grasses and Fodder Pl. N.S.W., (1923), 204.
SYN.: *Andropogon sericeus* R. Br.

D. tenue (*R. Br.*) *A. Camus* in Bull. Mus. Hist. Nat. Paris, XXVII (1921), 549.
VICE *Andropogon affinis* R. Br. The figure in Agric. Gaz. N.S.W., II (1891), 293, appears to represent *Bothriochloa decipiens.*

D. setosum *S. T. Blake* in Univ. Qld. Papers, Dept. Biol., II, No. 3 (1944), 50.

D. humilius *J. M. Black* in Trans. & Proc. Roy. Soc. S. Austral., LX (1936), 164,

D. annulatum (*Forsk.*) *Stapf* in Prain, Fl. Trop. Afr., IX (1917), 178.
SYN.: *Andropogon annulatus* Forsk.

Heteropogon *Pers.*

H. contortus *(L.) Beauv. ex Roem. et Schult.*, Syst. Veg., II (1817), 836. Based on *Andropogon contortus* L. (1753). Figd. Agric. Gaz. N.S.W., III (1892), 857.

Syn.: *H. hirtus Pers.* (1807), based on *Andropogon contortus* L.

Cymbopogon *Spreng.*

C. obtectus *S. T. Blake* in Univ. Qld. Papers, Dept. Biol., II. No. 3 (1944), 55. Figd. Agric. Gaz. N.S.W., III (1892), 855; Turner, Austral. Grasses, (1895), 4; Breakwell, Grasses and Fodder Pl. N.S.W., (1923), 205.

Vice *Andropogon bombycinus* R. Br.

C. exaltatus *(R. Br.) Domin* in Biblioth. Bot., LXXXV (1915), 273.

Syn.: *Andropogon exaltatus* R. Br.

C. refractus *(R. Br.) A. Camus* in Rev. Bot. Appliq., I (1921), 290. Figd. Agric. Gaz. N.S.W., II (1891), 439; Turner, Austral. Grasses, (1895), 7.

Syn.: *Andropogon refractus* R. Br.

Hyparrhenia *Anderss.*

H. filipendula *(Hochst.) Stapf* in Prain, Fl. Trop. Afr., IX (1918), 322. Figd. Agric. Gaz. N.S.W., III (1892), 949; Turner, Austral. Grasses, (1895), 6 sub *Andropogon lachnatherus.*

Syn.: *Andropogon filipendulus* Hochst.

H. hirta *(L.) Stapf in Prain,* Fl. Trop. Afr., IX (1919), 315.

Themeda *Forsk.*

T. australis *(R. Br.) Stapf* in Prain, Fl. Trop. Afr., IX (1919), 420. Figd. Agric. Gaz. N.S.W., I (1890), 309; l.c. III (1892), 1; l.c. XVI (1905), 1033; Turner, Austral. Grasses, (1895), 9 sub *Anthistiria ciliata.*

Vice *T. Forskalii* Hack.

T. avenacea *(F. Muell.) Durand et Jackson* in Index Kewensis, Suppl. I (1906), 424. Figd. Agric. Gaz. N.S.W., III (1892), 746; Turner, Austral. Grasses, (1895), 8 sub *Anthistiria avenacea.*

Iseilema *Anderss.*

I. membranaceum *(Lindl.) Domin* in Biblioth. Bot., LXXXV (1915), 280. Figd. Agric. Gaz. N.S.W., IV (1893), 81; Turner, Austral. Grasses, (1895), 11.

Vice *I. membranacea Anderss.*, who did not effect the combination.

I. vaginiflorum *Domin* in Biblioth. Bot., LXXXV (1915), 281.

Tragus Hall.

T. australianus *S. T. Blake* in Univ. Qld. Papers, Dept. Biol., I, No. 18 (1941), 12. Figd. Agric. Gaz. N.S.W., VII (1896), 130; Maiden, Manual of the Grasses of N.S.W., (1898), 64 sub *Lappago racemosa.*

Vice *T. racemosus* (L.) All.

Neurachne R. Br.

N. alopecuroides R. Br., Prodr., (1810), 196. Delete. This species is not yet represented from N.S.W. in the National Herbarium collections. Figd. Maiden, Manual of the Grasses of N.S.W., (1898), 66.

N. mitchelliana *Nees* in Hook. Lond. Journ. Bot., II (1843), 410. Figd. Agric. Gaz. N.S.W., II (1891), 28; Turner, Austral. Grasses, (1895), 33.

N. munroi *(F. Muell.) F. Muell.*, Fragm., VIII (1874), 200.

Perotis *Ait.*

P. rara *R. Br.,* Prodr., (1810), 172. Figd. Agric. Gaz. N.S.W., VIII (1897), 449; Maiden, Manual of the Grasses of N.S.W., (1898), 68.

Zoisia *Willd.* Vice *Zoysia.*

Z. macrantha *Desv.,* Opusc., (1831), 54; Mem. Soc. Agric. Angers., I (1831), 158. Figd. Agric. Gaz. N.S.W., III (1892), 231; Hook. Ic. Pl. (1935), t. 3264.

Vice *Z. pungens* Willd.

Arundinella *Raddi.*

A. nepalensis *Trin.,* Sp. Gram., (1833), t. 268.

Digitaria *Hall.*

D. coenicola (*F. Muell.*) *Hughes* in Kew Bull., (1923), 313.

Syn.: *Panicum coenicolum* F. Muell.

D. coenicola var. **ramosa** *J. Vickery* in Contrib. N.S.W. Nat. Herb., I, No. 6 (1951), 328

D. divaricatissima (*R. Br.*) *Hughes* in Kew Bull., (1923), 314. Figd. in Agric. Gaz. N.S.W., IV (1893), 305.

Syn.: *Panicum divaricatissimum* R. Br.; *P. divaricatissimum* var. *normale* Benth.; *P. divaricatissimum* var. *radiatum* (R. Br.) Benth.

Delete *P. divaricatissimum* var. *glaberrimum* Benth., which is not known from N.S.W.

D. ammophila (*F. Muell.*) *Hughes* in Kew Bull., (1923), 313. The specimen figured in Breakwell, Grasses and Fodder Pl. of N.S.W., (1923), 72 sub *Panicum divaricatissimum* appears to be this species.

Syn.: *Panicum divaricatissimum* var. *ammophilum* (F. Muell.) Benth.

D. hystrichoides *J. Vickery* in Contrib. N.S.W. Nat. Herb., I, No. 6 (1951), 324.

D. macractenia (*Benth.*) *Hughes* in Kew Bull., (1923), 314.

Syn.: *Panicum macractenium* Benth.

D. brownei (*Roem. et. Schult.*) *Hughes* in Kew Bull., (1923), 313. Figd. Agric. Gaz. N.S.W., IV (1893), 1; Turner, Austral. Grasses, (1895), 39; Breakwell, Grasses and Fodder Pl. N.S.W., (1923), 74.

Vice *Panicum leucophaeum* H. B. K.

D. hubbardii *Henrard,* Monog. Genus *Digitaria,* (1950), 334.

D. leucostachya (*Domin*) *Henrard,* Monog. Genus *Digitaria,* (1950), 399.

D. sanguinalis (*L.*) *Scop.,* Fl. Carn., ed. ii, I (1772), 52. Figd. Agric. Gaz. N.S.W., II (1891), 173; Turner, Austral. Grasses, (1895), 43; Breakwell, Grasses and Fodder Pl. N.S.W., (1923), 68. Delete from list of native grasses; naturalised in N.S.W.

Syn.: *Panicum sanguinale* L.

Delete: *P. sanguinale* var. *ciliare* Maiden et Betche.

D. didactyla *Willd.,* Enum. Pl. Hort. Berol., (1809), 91. Probably naturalised in N.S.W.

Syn.: *Panicum didactylum* (Willd.) Kunth.

Vice *Panicum tenuissimum* Benth.

D. sp. aff. **tenuissima.**

Digitaria (*contd.*)—

D. parviflora (*R. Br.*) *Hughes* in Kew Bull., (1923), 311. Figd. Agric. Gaz. N.S.W., II (1891), 240; Turner, Austral. Grasses, (1895), 41.

Syn.: *Panicum parviflorum* R. Br.

Delete: *P. parviflorum* var. *pilosum* Benth.

D. ramularis (*Trin.*) *Henrard* in Blumea, I (1940), 101.

D. diminuta *Hughes* in Kew Bull. (1923), 312.

D. orbata *Hughes,* l.c.

D. longiflora (*Retz.*) *Pers.,* Syn., I (1805), 85.

Syn.: *Paspalum brevifolium* Fluegge, (1810).

D. baileyi (*Benth.*) *Hughes* in Kew Bull., (1923), 311. Delete; it is not yet established that this species occurs in N.S.W.

Syn.: *Panicum baileyi* Benth.

Eriochloa *H. B. K.*

E. pseudoacrotricha (*Stapf ex Thell.*) *C. E. Hubbard ex S. T. Blake* in Trans. Roy. Soc. S. Austral., LXVII (1943), 43.

Vice *E. polystachya* H. B. K.

E. crebra *S. T. Blake* in Proc. Roy. Soc. Qld., LIX (1948), 156. The figures in Agric. Gaz. N.S.W., II (1891), 122 and in Turner, Austral. Grasses, (1895), 27 sub *E. punctata* probably represent this species.

Vice *E. polystachya* var. *punctata* (Hamilt.) Maiden et Betche.

E. procera (*Retz.*) *C. E. Hubbard* in Kew Bull., (1930), 256. Figd. Agric. Gaz. N.S.W., III (1892), 856 sub *E. annulata.*

Vice *E. polystachya* var. *annulata* (Kunth) Maiden et Betche.

E. australiensis *Stapf ex Thell.* in Viert. Nat. Ges. Zurich, LXV (1919), 697.

E. maidenii *A. A. Hamilton* in Proc. Linn. Soc. N.S.W., XXXVII (1913), 709.

Entolasia *Stapf.*

E. marginata (*R. Br.*) *Hughes* in Kew Bull., (1923), 331. Figd. Agric. Gaz. N.S.W., VII (1896), 8; Maiden, Manual of the Grasses of N.S.W. (1898), 46.

Syn.: *Panicum marginatum* R. Br.

E. stricta (*R. Br.*) *Hughes* in Kew Bull., (1923), 331. Possibly equals the preceding species.

Syn.: *Panicum strictum* R. Br.

Cleistochloa *C. E. Hubbard.*

C. subjuncea (*Domin*) *C. E. Hubbard* in Hook. Ic. Pl., XXXIII (1933), t. 3209.

Dimorphochloa *S. T. Blake.*

D. rigida *S. T. Blake* in Univ. Qld. Papers, Dept. Biol., I, No. 19 (1941), 2.

Brachiaria *Griseb.*

B. notochthona (*Domin*) *Stapf* in Prain, Fl. Trop. Afr., IX (1920), 597. Figd. Agric. Gaz. N.S.W., XIV (1903), 241.

Vice *Panicum helopus* Trin.

Delete *Panicum helopus* var. *glabrior* Benth.

B. gilesii (*Benth.*) *A. Chase* in Contrib. U.S. Nat. Herb., XXII (1920), 35.

Syn.: *Panicum gilesii* Benth.

Brachiaria (*contd.*)—

B. miliiformis (*Presl.*) *A. Chase* in Contrib. U.S. Nat. Herb., XXII (1920), 35. Figd. Agric. Gaz. N.S.W., III (1898), 747; Breakwell, Grasses and Fodder Pl. N.S.W., (1923), 79.

VICE *Panicum distachyon* ("distachyum") L.

B. foliosa (*R. Br.*) *Hughes* in Kew Bull., (1923), 315.

SYN.: *Panicum foliosum* R. Br.

B. praetervisa *C. E. Hubbard* in Kew Bull., (1934), 446. Figd. Agric. Gaz. N.S.W., VIII (1897), 684; Maiden, Manual of the Grasses of N.S.W., (1898), 43.

VICE *Panicum adspersum* Trin.

B. piligera (*F. Muell.*) *Hughes* var **intercedens** (*Domin*) *Hughes* in Kew Bull., (1923), 315.

B. advena *J. Vickery* in Contrib. N.S.W. Nat. Herb., I, No. 6 (1951), 329.

Paspalum *L.*

P. orbiculare *Forst. f.*, Flor. Ins. Austral. Prodr., (1786), 7. Figd. Agric. Gaz. N.S.W., IV (1893), 219.

VICE *P. scrobiculatum* L.

P. distichum *L.*, Syst. Nat., ed. x, II (1759), 855. Figd. Agric. Gaz. N.S.W., II (1891), 310; Turner, Austral. Grasses, (1895), 45; Breakwell, Grasses and Fodder Pl. N.S.W., (1923), 45.

P. vaginatum *Swartz,* Prodr. Veg. Ind. Occ., (1786), 21.

Paspalidium *Stapf.*

P. jubiflorum (*Trin.*) *Hughes* in Kew Bull., (1923), 317. Figd. Agric. Gaz. N.S.W., IV (1893), 149; Breakwell, Grasses and Fodder Pl. N.S.W., (1923), 64.

VICE *Panicum flavidum* Retz.

DELETE *Panicum flavidum* var. *tenuior* Benth.

P. aversum *J. Vickery* in Contrib. N.S.W. Nat. Herb., I, No. 6 (1951), 331.

P. radiatum *J. Vickery,* l.c., 332. The figure in Agric. Gaz. N.S.W., IV (1893), 150 sub *Panicum flavidum* var. *tenuior* is probably this species.

P. radiatum var. **hirsutum** *J. Vickery* in Contrib. N.S.W. Nat. Herb., I, No. 6 (1951), 334.

P. gracile (*R. Br.*) *Hughes* in Kew Bull., (1923), 318. Figd. Agric. Gaz. N.S.W., III (1892), 317; Turner, Austral. Grasses, (1895), 38.

SYN.: *Panicum gracile* R. Br.

P. gracile var. **debile** *J. Vickery* in Contrib. N.S.W. Nat. Herb., I., No. 6 (1951), 331.

P. caespitosum *C. E. Hubbard* in Kew Bull., (1934), 446.

P. rarum (*R. Br.*) *Hughes* in Kew Bull., (1923), 318.

P. globoideum (*Domin*) *Hughes,* l.c., 317.

Panicum *L.*

P. tulcumbense F. Turn. in Proc. Linn. Soc. N.S.W., XXIII (1898), 56. DELETE; the identity of this species has not been established and probably never will be.

P. airoides *R. Br.*, Prodr., (1810), 190. This species is very doubtfully admitted to this census on the evidence of a specimen cited by Hughes in Kew Bull., (1923), 324, from the Murray River, coll. Mueller. It is not represented from N.S.W. in the National Herbarium collections.

VICE *P. repens* L.

Panicum (*contd.*)—

P. pygmaeum *R. Br.*, Prodr., (1810), 191. Figd. Agric. Gaz. N.S.W., IX (1898), 32; Maiden, Manual of the Grasses of N.S.W., (1898), 45.

P. obseptum *Trin.*, Gram. Pan. Diss., II (1826), 149.

P. lachnophyllum *Benth.*, Fl. Austral., VII (1878), 486.

P. fulgidum *Hughes* in Kew Bull., (1923), 323. Figd. Agric. Gaz. N.S.W., III (1892), 234; Turner, Austral. Grasses, (1895), 35.

Syn.: *P. bicolor* R. Br. (1810) non Moench (1794).

P. acroanthum *Steud.*, Syn. Pl. Gram., (1854), 87. Figd. Agric. Gaz. N.S.W., II (1981), 562; Turner, Austral. Grasses, (1895), 40.

Syn.: *P. melananthum* F. Muell. (1855).

P. effusum *R. Br.*, Prodr., (1810), 191. Figd. Agric. Gaz. N.S.W., III (1892), 389; Turner, Austral. Grasses, (1895), 37; Breakwell, Grasses and Fodder Pl. N.S.W., (1923), 75.

Syn.: *P. effusum* var. *convallium* Benth.

P. buncei *F. Muell. ex Benth.*, Fl. Austral., VII (1878), 487.

P. subxerophilum *Domin* in Biblioth. Bot., LXXXV (1915), 316.

P. mitchelli Benth., Fl. Austral., VII (1878), 489. Delete; not known in N.S.W.

P. decompositium *R. Br.*, Prodr., (1810), 191. Figd. Agric. Gaz. N.S.W., III (1892), 641; Turner, Austral. Grasses, (1895), 36; Breakwell, Grasses and Fodder Pl. N.S.W., (1923), 66.

P. whitei *J. M. Black* in Trans. Roy. Soc. S. Austral., XLI (1917), 632. Figd. Agric. Gaz. N.S.W., X (1899), 495 sub *P. decompositum.*

P. queenslandicum (*Domin*) in Fedde Repert. Sp. Nov., X (1911), 58. Figd. Agric. Gaz. N.S.W., VIII (1897), 854; Maiden, Manual of the Grasses of N.S.W., (1898), 50 sub *P. trachyrhachis.* Also figd. Breakwell, Grasses and Fodder Pl. N.S.W., (1923), 78 sub *P. benthami.*

Vice *P. trachyrhachis* Benth.

P. queenslandicum var. **acuminatum** *J. Vickery* in Contrib. N.S.W. Nat. Herb., I, No. 6 (1951), 334.

P. prolutum *F. Muell.* in Trans. Vict. Inst., (1855), 46. Figd. Agric. Gaz. N.S.W., II (1891), 123; Turner, Austral. Grasses, (1895), 42. The specimen figured in Breakwell, Grasses and Fodder Pl. N.S.W., (1923), 61 sub *P. prolutum* is quite a different species.

P. paludosum *Roxb.*, Fl. Ind., I (1820), 307. Doubtfully native to N.S.W.

Ancistrachne *S. T. Blake.*

A. uncinulata (*R. Br.*) *S. T. Blake* in Univ. Qld. Papers, Dept. Biol., I, No. 19 (1941), 5.

Syn.: *Panicum uncinulatum* R. Br.

Sacciolepis *Nash.*

S. indica (*L.*) *Chase* in Proc. Biol. Soc. Wash., XXI (1908), 8.

Syn.: *Panicum indicum* L.

Isachne *R. Br.*

I. australis *R. Br.*, Prodr., (1810), 196. Figd. Agric. Gaz. N.S.W., III (1892), 233; Turner, Austral. Grasses, (1895), 31.

Oplismenus *Beauv.*

O. aemulus (*R. Br.*) *Kunth,* Rev. Gram., I (1829), 44. Figd. Agric. Gaz. N.S.W., II (1891), 440; Turner, Austral. Grasses, (1895), 34.

VICE *O. compositus* (L.) Beauv.

O. aemulus var. **lasiorhachis** *Domin* in Biblioth. Bot., LXXXV (1915), 329.

O. imbecillis (*R. Br.*) *Roem. et Schult.,* Syst. Veg., II (1817-19), 487.
VICE *O. compositus* var. *setarius* (Roem. et Schult.) F. M. Bailey.

O. undulatifolius var. **mollis** *Domin* in Biblioth. Bot., LXXXV (1915), 329.

Paractaenum *Beauv.*

P. novaehollandiae *Beauv.,* Agrost., (1812), 47, t. X, f. 6. Figd. Agric. Gaz. N.S.W., VIII (1897), 606; Maiden, Manual of the Grasses of N.S.W., (1898), 37.

SYN.: *Panicum reversum* F. Muell.

Echinochloa *Beauv.*

E. colonum (*L.*) *Link,* Hort. Berol., II (1833), 209. Probably introduced.

SYN.: *Panicum colonum* L.

E. crusgalli (*L.*) *Beauv.,* Agrost., (1812), 161. Figd. Agric. Gaz. N.S.W., II (1891), 172; Breakwell, Grasses and Fodder Pl. N.S.W., (1923), 70. Probably introduced.

SYN.: *Panicum crusgalli* L.

E. crusgalli var. **lacunaria** (*F. Muell.*) *Hughes* in Kew Bull., (1923), 320.

Alloteropsis *Presl. emend. Hitchc.*

A. semialata (*R. Br.*) *Hitchc.* in Contrib. U.S. Nat. Herb., XII (1909), 210. Figd. Agric. Gaz. N.S.W., VIII (1897), 683; Maiden, Manual of the Grasses of N.S.W., (1898), 33.

SYN.: *Panicum semialatum* R. Br.

Setaria *Beauv.*

S. glauca (*L.*) *Beauv.,* Agrost., (1812), 51, 178. Figd. Agric. Gaz. N.S.W., II (1891), 441; Turner, Austral. Grasses, (1895), 48; Breakwell, Grasses and Fodder Pl. N.S.W., (1923), 86. Probably introduced.

S. australiensis (*Scribn. et Merr.*) *J. Vickery* in Contrib. N.S.W. Nat. Herb., I, No. 6 (1951), 335.

S. macrostachya H. B. et K., Nov. Gen. et Spec., I (1815), 110. DELETE; not known in N.S.W.

Pseudoraphis *Griffith.*

P. paradoxa (*R. Br.*) *Pilger* in Notizbl. Bot. Gard. Berlin, X (1928), 210. Figd. Agric. Gaz. N.S.W., VIII (1897), 521; Maiden, Manual of the Grasses of N.S.W., (1898), 59.

SYN.: *Chamaeraphis paradoxa* (R. Br.) Poir.

P. spinescens (*R. Br.*) *J. Vickery,* Proc. Roy. Soc. Qld., LXII (1952), 69. Figd. Agric. Gaz. N.S.W., XI (1900), 721.

SYN.: *Chamaeraphis spinescens* (R. Br.) Poir.

Pennisetum *L. C. Rich.*

P. compressum *R. Br.,* Prodr., (1810), 195. Figd. Agric. Gaz. N.S.W., II (1891), 375.

Plagiosetum *Benth.*

P. refractum (*F. Muell.*) *Benth.* in Hook. Ic. Pl., (1877), t. 1242.

Cenchrus *L.*

C. australis *R. Br.,* Prodr., (1810), 196. Figd. Agric. Gaz. N.S.W., IV (1893), 83.

Spinifex *L.*

S. hirsutus *Labill.,* Nov. Holl. Pl., II (1806), 81, tt. 230, 231. Also figd. Agric. Gaz. N.S.W., V (1894), 835; Maiden, Manual of the Grasses of N.S.W., (1898), 60.

Zygochloa *S. T. Blake.*

Z. paradoxa (*R. Br.*) *S. T. Blake* in Univ. Qld. Papers, Dept. Biol., I, No. 19 (1941), 8.

Syn.: *Spinifex paradoxus* (R. Br.) Benth.

Uranthoecium *Stapf.*

U. truncatum (*Maiden et Betche*) *Stapf* in Hook. Ic. Pl., (1916), t. 3073. Figd. also in Proc. Linn. Soc. N.S.W., XXXI (1906), 741.

Syn.: *Rottboellia truncata* Maiden et Betche.

Potamophila *R. Br.*

P. parviflora *R. Br.,* Prodr., (1810), 211.

Leersia *Swartz.*

L. hexandra *Swartz,* Prodr. Veg. Ind. Occ., (1788), 21.

Microlaena *R. Br.*

M. stipoides (*Labill.*) *R. Br.,* Prodr., (1810), 210. Figd. Agric. Gaz. N.S.W., II (1891), 22.

Tetrarrhena *R. Br.*

T. juncea *R. Br.,* Prodr., (1810), 210.

Hierochloe ~~*Gmel.*~~ R. Br.

H. redolens (Sol. ex Vahl, sub Holcus) Roem & Schult. 1817 ~~*R. Br.,* Prodr., (1810), 209~~. Figd. Agric. Gaz. N.S.W., XV (1904), 244.

H. rariflora *Hook. f.,* Fl. Antarct., I (1844), 93. Figd. Agric. Gaz. N.S.W., V (1894), 359; Maiden, Manual of the Grasses of N.S.W., (1898), 103.

Amphipogon *R. Br.*

A. strictus *R. Br.,* Prodr., (1810), 175. Figd. Agric. Gaz. N.S.W., XX (1909), 733 sub *A. strictus* var. *setifer.*

A. strictus var. *setifer* Benth. Fl. Austral., VII (1878), 598. Delete; not yet found in N.S.W.

A. caricinus *F. Muell.* in Linnaea, XXV (1852), 445. Figd. Agric. Gaz. N.S.W., III (1892), 748; Turner, Austral. Grasses, (1895), 2 sub *A. strictus.*

Aristida *L.*

A. stipoides R. Br., Prodr., (1810), 174. Delete; not known from N.S.W. The figures in Agric. Gaz. N.S.W., VII (1896), 650, and Maiden, Manual of the Grasses of N.S.W., (1898), 106, appear to represent either *A. browniana* or *A. muelleri.*

A. browniana *Henrard* in Meded. Herb. Leid., No. 54 (1926), 63. The figures in Agric. Gaz. N.S.W., VII (1896), 650, and in Maiden, Manual of the Grasses of N.S.W., (1898), 106 sub *A. stipoides* probably represent this species.

A. muelleri *Henrard.* l.c., No. 54a (1927), 358. Possibly conspecific with the preceding.

Aristida (*contd.*)—

A. arenaria *Gaud.* in Freyc. Voy. Bot., (1826), 407. Figd. Agric. Gaz. N.S.W., X (1899), 1258.

A. behriana *F. Muell.* in Trans. Vict. Inst., (1855), 44. Figd. Agric. Gaz. N.S.W., XI (1900), 201; Breakwell, Grasses and Fodder Pl. N.S.W., (1923), 227.

A. leichhardtiana *Domin* in Fedde Repert. Sp. Nov., IX (1911), 551.

A. obscura *Henrard* in Meded. Herb. Leid., No. 54A (1927), 385.

A. obscura var. **luxurians** *Henrard,* l.c.

A. leptopoda *Benth.,* Fl. Austral., VII (1878), 561.

A. warburgii *Mez* in Fedde Repert. Sp. Nov., XVII (1921), 149.

A. psammophila *Henrard* in Meded. Herb. Leid., No. 58A (1932), 229 in clavi; l.c., No. 54c Suppl. (1933), 734.

A. vagans *Cav.,* Ic. Pl. Hisp., V (1799), 45, t. 471. The figure in Agric. Gaz. N.S.W., XI (1900), 282, resembles *A. ramosa* as much as it does *A. vagans.*

A. caputmedusae *Domin* in Biblioth. Bot., LXXXV (1915), 344.

A. longicollis *Henrard* in Meded. Herb. Leid., No. 54 (1926), 14; l.c. No. 54A (1927), 306.

A. ramosa *R. Br.,* Prodr., (1810), 173. The figure in Agric. Gaz. N.S.W., XI (1900), 533, is not this species, but is probably *A. jerichoensis* var. *subspinulifera.*

A. echinata *Henrard* in Meded. Herb. Leid., No. 58 (1929), 285, in clavi; l.c., 713 latine. The specimen figured in Agric. Gaz. N.S.W., XI (1900), 534 sub *A. calycina* is probably this species.

A. muricata *Henrard* in Meded. Herb. Leid., No. 58A (1932), 286 in clavi; l.c., No. 54c Suppl. (1933), 727, latine.

A. personata *Henrard,* l.c., No. 58A (1932), 290 in clavi; l.c., No. 54c Suppl., (1933), 731, latine.

A. gracilipes *Henrard,* l.c., No. 54 (1926), 209.

A. armata *Henrard,* l.c., No. 58A (1932), 197, in clavi; l.c., No. 54c, Suppl., (1933), 703, latine.

A. jerichoensis var. **subspinulifera** *Henrard,* Monog. *Aristida,* II (1932), 300; Meded. Herb. Leid., No. 54c (1933), 722, latine. The figure in Agric. Gaz. N.S.W., XI (1900), 534, sub *A. ramosa* appears to represent this variety.

A. benthami *Henrard* in Meded. Herb. Leid., No. 58A (1932), 246 in clavi; l.c., No. 54c, Suppl., (1933), 705, latine.

A. calycina *R. Br.,* Prodr., (1810), 173. The figure in Agric. Gaz. N.S.W., XI (1900), 534, is not this species, but probably represents *A. echinata.*

A. glumaris *Henrard* in Meded. Herb. Leid., No. 58A (1932), 247 in clavi; l.c., No. 54c, Suppl. (1933), 718, latine. Possibly conspecific with the preceding.

A. ingrata *Domin* in Biblioth. Bot., LXXXV (1915), 346.

A. anthoxanthoides *Henrard* in Meded. Herb. Leid., No. 54 (1926), 10, 29.

A. acuta *S. T. Blake* in Proc. Roy. Soc. Qld., LI (1940), 169.

A. depressa Retz., Observ. Bot., (1787), 22. DELETE; not in N.S.W.

Stipa *L.*

S. elegantissima *Labill.,* Pl. Nov. Holl., I (1804), 23 24, t. 29.

S. tuckeri *F. Muell.,* Fragm. Phyt. Austral., XI (1881), 128.

S. verticillata *Nees* in Spreng., Syst., IV, Cur. Post., (1827), 30.

S. ramosissima *Trin.* in Mem. Acad. Petersb., Ser. vi, I (1831), 74.

Stipa (*contd.*)—

- *S. flavescens* Labill., Pl. Nov. Holl., I (1~~9~~804), 24, t. 30. Delete; not known in N.S.W.
- **S. setacea** *R. Br.*, Prodr., (1810), 174. The specimen figured in Agric. Gaz. N.S.W., V (1894), 136, and in Maiden, Manual of the Grasses of N.S.W., (1898), 113, is not this species, but its exact identity is uncertain, possibly *S. variabilis.*
- **S. mollis** *R. Br.*, Prodr., (1810), 174.
  Syn.: *S. semibarbata* var. *mollis* Benth.
  Vice *S. semibarbata* R. Br.
- **S. densiflora** *Hughes* in Kew Bull., (1921), 18.
- **S. pubescens** *R. Br.*, Prodr., (1810), 174. 1950
- **S. nervosa** *J. Vickery* in Contrib. N.S.W. Nat. Herb., I, No. 6 (1951), 335.
- **S. nervosa** var. **neutralis** *J. Vickery*, l.c., 337.
- **S. aristiglumis** *F. Muell.* in Trans. Vict. Inst., I (1855), 43.
- **S. blackii** *C. E. Hubbard* in Kew Bull., (1925), 431.
- **S. bigeniculata** *Hughes* in Kew Bull., (1922), 20.
- **S. fusca** *C. E. Hubbard* in Kew Bull., (1925), 432.
- **S. acrociliata** *F. M. Reader* in Vict. Nat., XIII (1897), 167.
- **S. scabra** *Lindl.* in Mitch., Journ. Trop. Austral., (1848), 31.
- **S. variabilis** *Hughes* in Kew Bull., (1921), 15.
- **S. drummondii** *Steud.*, Syn. Pl. Glum Gram., I (1854), 128.
- **S. platychaeta** *Hughes* in Kew Bull., (1921), 16.

Echinopogon *Beauv.*

- **E. ovatus** (~~G.~~ *Forst. f.*) *Beauv.*, Agrost., (1812), 42.
- **E. caespitosus** *C. E. Hubbard* in Hook. Ic. Pl., XXXIII (1935), sub t. 3261, 6. The figure in Agric Gaz. N.S.W., III (1892), 388, sub *E. ovatus* represents this species as to the panicle on the right-hand side of the plate; that on the left-hand side of the plate probably represents a distinct species.
- **E. caespitosus** var. **cunninghamii** *C. E. Hubbard* in Hook. Ic. Pl., XXXIII (1935), sub t. 3261, 7.
- **E. cheelii** *C. E. Hubbard*, l.c., 3.
- **E. intermedius** *C. E. Hubbard*, l.c., t. 3261.
- **E. nutans** *C. E. Hubbard*, l.c., sub t. 3261, 4.
- **E. nutans** var. **major** *C. E. Hubbard*, l.c., 5.
- **E. mckiei** *C. E. Hubbard*, l.c., 9.
- **E. phleoides** *C. E. Hubbard*, l.c., 10.

Alopecurus *L.*

- **A. australis** *Nees* in London Journ. Bot., II (1843), 412. This was described as a native Australian species, but I cannot distinguish it from the European *A. geniculatus* L., and consider that it may have been an early introduction to inland districts. Figd. Agric. Gaz. N.S.W., III (1892), 318; Turner, Austral. Grasses, (1895), 1; Breakwell, Grasses and Fodder Pl. N.S.W., (1923), 248.

Sporobolus *R. Br.*

- **S. virginicus** (*L.*) *Kunth*, Rev. Gram., I (1829), 67. Figd. Agric. Gaz. N.S.W., XX (1909), 52.

Sporobolus (*contd.*)—

S. virginicus var. *pallidus* Benth., Fl. Austral., VII (1878), 621. DELETE; this was described on a mixture of specimens of *S. virginicus, S. mitchellii* and other species.

S. elongatus *R. Br.,* Prodr., (1810), 170.

S. indicus (L.) R. Br., Prodr., (1810), 170. DELETE; the specimens from N.S.W. once referred to this species are variously *S. elongatus* (native) and *S. capensis* (naturalised). The figures in Agric. Gaz. N.S.W., II (1891), 307; l.c., V (1894), 389; Turner, Austral. Grasses, (1895), 52, probably represent *S. capensis* rather than *S. elongatus.*

S. diander (*Retz.*) *Beauv.,* Agrost., (1812), 26, 127, 178. Figd. Agric. Gaz. N.S.W., III (1892), 148; Turner, Austral. Grasses., (1895), 51; Breakwell, Grasses and Fodder Pl. N.S.W., (1923), 103.

S. pulchellus R. Br., Prodr., (1810), 170. DELETE; not in N.S.W. Specimens once referred to this species are variously *S. australasicus* Domin (figd. Agric. Gaz. N.S.W., XIX (1908), 1010) and *S. lenticularis* S. T. Blake, which are not represented from N.S.W. in the National Herbarium collections.

S. caroli *Mez* in Fedde Rep. Spec. Nov., XVII (1921), 299. Figd. Agric. Gaz. N.S.W., III (1892), 319; Turner, Austral. Grasses, (1895), 53.
VICE *S. Lindleyi* (Steud.) Benth.

S. actinocladus (*F. Muell.*) *F. Muell.,* Fragm., VIII (1873), 140. Figd. Agric. Gaz. N.S.W., XIX (1908), 925.

S. contiguus *S. T. Blake* in Univ. Qld. Papers, Dept. Biol., I, No. 18, (1941), 6.

S. mitchellii (*Trin.*) *C. E. Hubbard ex S. T. Blake,* l.c., 22. Figd. Agric. Gaz. N.S.W., XX (1909), 222.
VICE *C. Benthami* F. M. Bail.

Agrostis *L.*

A. hiemalis (*Walt.*) *B. S. P.,* Prel. Cat. N.Y., (1888), 68. Based on *Cornucopiae hiemalis* Walt. (1788).
VICE *A. scabra* Willd. (1797). The figure in Agric. Gaz. N.S.W., X (1899), 1166 sub *A. scabra* is *A. australiensis.*

A. parviflora *R. Br.,* Prodr., (1810), 170.

A. muelleriana *J. Vickery* in Contrib. N.S.W. Nat. Herb., I, No. 3 (1941), 103. Figd. Agric. Gaz. N.S.W., X (1899), 1164.
SYN.: *A. muelleri* Benth. (1878), non Presl. (1844).

A. australiensis *Mez* in Fedde Repert. Sp. Nov., XVII (1921), 302. Figd. Agric. Gaz. N.S.W., X (1899), 1166 sub *A. scabra.*

A. venusta *Trin.* in Mem. Acad. Petersb., Ser. vi, VI (1841), 340. Figd. Agric. Gaz. N.S.W., X (1899), 725.

A. boormanii *J. Vickery* in Contrib. N.S.W. Nat. Herb., I, No. 3 (1941), 105.

A. billardieri *R. Br.,* Prodr., (1810), 171.
SYN.: *Calamagrostis aemula* var. *billardieri* Maiden et Betche. The figure in Agric. Gaz. N.S.W., II (1891), 309 represents *A. aemula.*

A. aemula *R. Br.,* Prodr., (1810), 172. Figd. Agric. Gaz. N.S.W., II (1891), 309; Turner, Austral. Grasses, (1895), 20 sub *Deyeuxia billardieri.*
SYN.: *Calamagrostis aemula* (R. Br.) Steud.

A. avenacea *Gmel.,* Syst. Nat., Part I (1791), 171. Figd. Agric. Gaz. N.S.W., II (1891), 25 sub *Deyeuxia forsteri;* Breakwell, Grasses and Fodder Pl. N.S.W., (1923), 106 sub *Agrostis forsteri.*

Agrostis (*contd.*)—

A. plebeia *R. Br.,* Prodr., (1810), 172.
Syn.: *Calamagrostis aemula* var. *plebeia* (R. Br.) Maiden et Betche.

Deyeuxia *Clar. ex Beauv.*

D. quadriseta (*Labill.*) *Benth.,* Fl. Austral., VII (1878), 581. Figd. Agric. Gaz. N.S.W., II (1891), 563.
Syn.: *Calamagrostis quadriseta* (Labill.) Spreng.

D. mesathera *J. Vickery* in Contrib. N.S.W. Nat. Herb., I. No. 2 (1940), 53.

D. densa Benth., Fl. Austral., VII (1878), 582. Delete; not represented from N.S.W. in the National Herbarium collections.
Syn.: *Calamagrostis densa* (Benth.) Maiden et Betche.

D. appressa *J. Vickery* in Contrib. N.S.W. Nat. Herb., I, No. 2 (1940), 54.

D. imbricata *J. Vickery,* l.c., 55.

D. monticola (*Roem. et Schultz.*) *J. Vickery,* l.c., 56. The figure in Agric. Gaz. N.S.W., XII (1901), 1199, as to the panicle and spikelets probably represents this species, but the leafy culm is that of a different species, possibly *D. quadriseta.*
Syn.: *Calamagrostis quadriseta* var. *montana* (R. Br.) Maiden et Betche, based on *Agrostis montana* R. Br. (1810), non Krock. (1787).

D. monticola var. **valida** *J. Vickery* in Contrib. N.S.W. Nat. Herb., I, No. 2 (1940), 57.

D. carinata *J. Vickery,* l.c., 58.

D. crassiuscula *J. Vickery,* l.c., 59. Figd. Agric. Gaz. N.S.W., XIII (1902), 375.
Syn.: *Calamagrostis nivalis* (F. Muell.) Maiden et Betche, based on *Agrostis nivalis* F. Muell. (1855). Syn.: *Deyeuxia nivalis* (F. Muell.) Benth. (1878) non Wedd. (1875).

D. rodwayi *J. Vickery* in Contrib. N.S.W. Nat. Herb., I, No. 2 (1940), 60.

D. frigida *F. Muell. ex Benth.,* Fl. Austral., VII (1878), 583.
Syn.: *Calamagrostis frigida* (F. Muell. ex Benth.) Maiden et Betche.

D. benthamiana *J. Vickery* in Contrib. N.S.W. Nat. Herb., I, No. 2 (1940), 63.

D. scaberula *J. Vickery,* l.c., 64.
Vice *Calamagrostis rudis* Steud.

D. contracta (*F. Muell.*) *J. Vickery,* l.c., 65.

D. microseta *J. Vickery,* l.c., 66.

D. angustifolia *J. Vickery,* l.c., 67.

D. nudiflora *J. Vickery,* l.c., 67.

D. brachyathera (*Stapf*) *J. Vickery,* l.c., 68. Figd. Agric. Gaz. N.S.W., XXII (1911), 816.
Syn.: *Dichelachne brachyathera* Stapf.

D. reflexa *J. Vickery* in Contrib. N.S.W. Nat. Herb., I, No. 2 (1940), 69.

D. decipiens (*R. Br.*) *J. Vickery,* l.c., 70.

D. parviseta *J. Vickery,* l.c., 71.

D. parviseta var. **boormanii** *J. Vickery,* l.c., 72.

D. mckiei *J. Vickery,* l.c., 72.

D. acuminata *J. Vickery,* l.c., 73.

D. gunniana (*Nees*) *Benth.,* Fl. Austral., VII (1878), 584. Based on *Echinopogon gunnianus* Nees (1843). Figd. Agric. Gaz. N.S.W., XIII (1902), 593
Syn.: *Calamagrostis breviglumis* (Benth.) Maiden et Betche, based on *Deyeuxia breviglumis* Benth. (1878).

Dichelachne *Endl.*

D. crinita (*L.*) *Hook. f.*, Fl. N. Zel., I (1853), 293. Figd. Agric. Gaz. N.S.W., II (1891), 92; Turner, Austral. Grasses, (1895), 21.

D. sciurea (*R. Br.*) *Hook. f.*, Fl. N. Zel., I (1853), 294. Figd. Agric. Gaz. N.S.W., II (1891), 93; Turner, Austral. Grasses, (1895), 22.

D. rara (*R. Br.*) *J. Vickery* in Contrib. N.S.W. Nat. Herb., I, No. 6 (1951), 337.

Pentapogon *R. Br.*

P. quadrifidus (*Labill.*) *Baill.*, Hist. Pl., XII (1894), 280. Based on *Agrostis quadrifida* Labill. (1804). Figd. Agric. Gaz. N.S.W., III (1892), 541; Turner, Austral. Grasses, (1895), 46.

SYN.: *P. billardieri* R. Br. (1810).

Eriachne *R. Br.*

E. aristidea *F. Muell.*, Fragm., V (1866), 205. Figd. Agric. Gaz. N.S.W., XVI (1905), 26.

E. pallida F. Muell. ex Benth., Fl. Austral., VII (1878), 631. DELETE; not known from N.S.W.

E. pallescens *R. Br.*, Prodr., (1810), 184.

E. mucronata *R. Br.*, l.c. The figure in Agric. Gaz. N.S.W., II (1891), 27 sub *E. obtusa* appears to represent this species.

E. helmsii (*Domin*) *W. Hartley* in Proc. Linn. Soc., Bot., LII (1942), 346.

VICE *E. obtusa* R. Br., not known from N.S.W.

E. glabrata (*Maiden*) *W. Hartley* in Proc. Linn. Soc., Bot., LII (1942), 347. Figd. Agric. Gaz. N.S.W., XIX (1908), 836.

SYN.: *E. obtusa* var. *glabrata* Maiden.

Deschampsia *Beauv.*

D. caespitosa (*L.*) *Beauv.*, Agrost., (1812), 91, t. 18, f. 3. Figd. Agric. Gaz. N.S.W., VII (1896), 252; Maiden, Manual of the Grasses of N.S.W., (1898), 128. Probably introduced.

Trisetum *Pers.*

T. spicatum (*L.*) *Richt.*, Pl. Eur., I (1890), 59. Based on *Aira spicata* L. (1753). Figd. Agric. Gaz. N.S.W., IV (1893), 415.

SYN.: *Trisetum subspicatum* (L.) Beauv., based on *Aira subspicata* L. (1759), which was based on *A. spicata* L.

Amphibromus *Nees.*

A. neesii *Steud.*, Syn. Pl. Gram., (1854), 328. Figd. Agric. Gaz. N.S.W., II (1891), 561.

A. gracilis *P. F. Morris* in Vict. Nat., LI (1934), 145.

A. whitei *C. E. Hubbard* in Kew Bull., (1941), 30.

Anisopogon *R. Br.*

A. avenaceus *R. Br.*, Prodr., (1810), 176. Figd. Agric. Gaz. N.S.W., VII (1896), 561; Maiden, Manual of the Grasses of N.S.W., (1898), 132.

Danthonia *DC.*

D. rodwayi *C. E. Hubbard* in Hook. Ic. Pl. (1943), t. 3439.

D. paradoxa *R. Br.*, Prodr., (1810), 177. Figd. Agric. Gaz. N.S.W., XII (1901), 547.

Danthonia (*contd.*)—

D. bipartita *F. Muell.*, Fragm., I (1859), 160; l.c., VIII (1873), 136. Figd. Agric. Gaz. N.S.W., II (1891), 23; l.c., XXXI (1920), 26; Breakwell, Grasses and Fodder Pl. N.S.W., (1923), 231.

D. vickeryi *C. E. Hubbard* in Hook. Ic. Pl., (1943), t. 3439.

D. pallida *R. Br.*, Prodr., (1810), 177. Figd. Agric. Gaz. N.S.W., III (1892), 947 sub *D. robusta;* Breakwell, Grasses and Fodder Pl. N.S.W., (1923), 233.
SYN.: *D. penicillata* var. *pallida* (R. Br.) Maiden et Betche.

D. frigida *J. Vickery* in Contrib. N.S.W. Nat. Herb., I, No. 5 (1950), 298.
VICE *D. robusta* F. Muell.

D. carphoides *F. Muell. ex Benth.*, Fl. Austral., VII (1878), 592. Figd. Agric. Gaz. N.S.W., III (1892), 540; Turner, Austral. Grasses, (1895), 18.

D. geniculata *J. M. Black* in Trans. and Proc. Roy. Soc. S. Austral., LIII (1929), 261.

D. monticola *J. Vickery* in Contrib. N.S.W. Nat. Herb., I, No. 5 (1950), 299.

D. richardsonii *Cashmore* in Comm. Austral., C.S.I.R., Bull. 69 (1932), App., 2; Trans. and Proc. Roy. Soc. S. Austral., LVII (1933), 72.

D. linkii *Kunth.*, Enum., I (1833), 315. The figure in Agric. Gaz. N.S.W., II (1891), 174 sub *D. pallida* resembles this species.

D. linkii var. **fulva** *J. Vickery* in Contrib. N.S.W. Nat. Herb., I, No. 5 (1950), 299.

D. induta *J. Vickery*, l.c.

D. semiannularis (*Labill.*) *R. Br.*, Prodr., (1810), 177.
SYN.: *D. penicillata* var. *semiannularis* (Labill.) Maiden et Betche.

D. longifolia *R. Br.*, Prodr., (1810), 176.
SYN.: *D. penicillata* var. *longifolia* (R. Br.) Maiden et Betche.

D. purpurascens *J. Vickery* in Contrib. N.S.W. Nat. Herb., I, No. 5 (1950), 301.

D. setacea *R. Br.*, Prodr., (1810), 177.

D. alpicola *J. Vickery* in Contrib. N.S.W. Nat. Herb., I, No. 5 (1950), 297.

D. caespitosa *Gaud.* in Freyc., Voy. Bot., (1826), 408. Figd. Agric. Gaz. N.S.W., I (1890), 313; l.c., II (1891), 719; Turner, Austral. Grasses, (1895), 19 sub *D. semiannularis.*

D. eriantha *Lindl.* in Mitch., Three Exped. Eastern Austral., II (1838), 304.

D. duttoniana *Cashmore* in Comm. Austral., C.S.I.R., Bull. 69 (1932), App., 2; Trans. and Proc. Roy. Soc. S. Austral., LVII (1933), 72.

D. auriculata *J. M. Black* in Trans. and Proc. Roy. Soc. S. Austral., LIII (1929), 261.

D. laevis *J. Vickery* in Contrib. N.S.W. Nat. Herb., I, No. 5 (1950), 299.

D. pilosa *R. Br.*, Prodr., (1810), 177.
SYN.: *D. penicillata* var. *pilosa* (R. Br.) Maiden et Betche.

D. penicillata (*Labill.*) *Beauv.*, Agrost., (1812), 92, 153, 160.

D. racemosa *R. Br.*, Prodr., (1810), 177.
SYN.: *D. penicillata* var. *racemosa* (R. Br.) Maiden et Betche.

D. racemosa var. **obtusata** *F. Muell. ex Benth.*, Fl. Austral., VII (1878), 594.

D. nudiflora *P. F. Morris* in Vict. Nat., LII (1935), 111.

D. nivicola *J. Vickery* in Contrib. N.S.W. Nat. Herb., I, No. 5 (1950), 300. Figd. Agric. Gaz. N.S.W., XII (1901), 477.
VICE *D. pauciflora* R. Br., which is not known from N.S.W.

Cynodon *Rich.*

C. dactylon (*L.*) *Pers.*, Syn. Pl., I (1805), 85. Figd. Agric. Gaz. N.S.W., II (1891), 238; Breakwell, Grasses and Fodder Pl. N.S.W., (1923), 192. Possibly introduced.

C. incompletus Nees in Linnaea, VII (1832), 301. Figd. Agric. Gaz. N.S.W., XXIII (1912), 296. DELETE from native list; naturalised in N.S.W.

Brachyachne (*Benth.*) *Stapf.*

B. convergens (*F. Muell.*) *Stapf* in Hook. Ic., Pl., (1922), t. 3099.

SYN.: *Cynodon convergens* F. Muell.

B. ciliaris (*Benth.*) *C. E. Hubbard* in Kew Bull., (1934), 448. Figd. Agric. Gaz. N.S.W., XXII (1911), 408.

SYN.: *Cynodon ciliaris* Benth.

Chloris *Swartz.*

C. acicularis *Lindl. in Mitch.*, Journ. Trop. Austral., (1848), 33. Figd. Agric. Gaz. N.S.W., III (1892), 147; Turner, Austral. Grasses, (1895), 16.

C. divaricata *R. Br.*, Prodr.. (1810), 186. The figure in Agric. Gaz. N.S.W., XIX (1908), 682, represents *C. pectinata.*

C. truncata *R. Br.*, Prodr., (1810), 186. Figd. Agric. Gaz. N.S.W., II (1891), 24; Turner, Austral. Grasses, (1895), 17.

C. ventricosa *R. Br.*, Prodr., (1810), 186. Figd. Agric. Gaz. N.S.W., XI (1900), 1007.

C. scariosa *F. Muell.*, Fragm., VI (1868), 85.

C. barbata Swartz. var. *decora* (Nees) Benth., Fl. Austral., VII (1878), 613. DELETE; not known from N.S.W.

C. pectinata *Benth.*, Fl. Austral., VII (1878), 612. Figd. Agric. Gaz. N.S.W., XIX (1908), 682, sub *C. divaricata.*

Tripogon *Roth.*

T. loliiformis (*F. Muell.*) *C. E. Hubbard* in Kew Bull., (1934), 448. Figd. Agric. Gaz. N.S.W., XIII (1902), 723.

SYN.: *Diplachne loliiformis* (F. Muell.) F. Muell. ex Benth.

Astrebla *F. Muell. ex Benth.*

A. pectinata (*Lindl.*) *F. Muell. ex Benth.*, Fl. Austral., VII (1878), 602. Figd. Agric. Gaz. N.S.W., I (1890), 311; l.c., II (1891), 644; Turner, Austral. Grasses, (1895), 12.

A. squarrosa *C. E. Hubbard* in Kew Bull., (1928), 259. Figd. Breakwell, Grasses and Fodder Pl. N.S.W., (1923), 237, fig 1 (only), sub *A. triticoides.*

VICE *A. triticoides* var. *lappacea* (Lindl.) Benth.

A. lappacea (*Lindl.*) *Domin* in Biblioth. Bot., LXXXV (1915), 372. Figd. Agric. Gaz. N.S.W., I (1890), 312; l.c., II (1891), 646; Turner, Austral. Grasses, (1895), 13; Breakwell, Grasses and Fodder Pl. N.S.W., (1923), 237, figs. 2 and 3.

SYN.: *A. triticoides* (Lindl.) F. Muell. ex Benth.

A. elymoides *F. Muell. ex F. M. Bail.*, Illustr. Monog. Grasses Qld., (1879), t. 8 Figd. Agric. Gaz. N.S.W., I (1890), 310; l.c., II (1891), 647.

Eleusine Gaertn.

E. indica (L.) Gaertn., Fruct., I (1788), 8. Figd. Agric. Gaz. N.S.W., II (1891), 91; Turner, Austral. Grasses, (1895), 24. DELETE from native list; naturalised in N.S.W.

Dactyloctenium *Willd.*

D. radulans (*R. Br.*) *Beauv.*, Agrost., (1812), 72. Figd. Agric. Gaz. N.S.W., IV (1893), 151, sub *Eleusine aegyptiaca.*

Vice *D. aegyptiacum* Willd.

D. australe *Steud.*, Syn. Pl. Gram., (1854), 212. Doubtfully native in N.S.W.

Leptochloa *Beauv.*

L. digitata (*R. Br.*) *Domin* in Biblioth. Bot., LXXXV (1915), 379, based on *Poa digitata* R. Br. (1910). Figd. Agric. Gaz. N.S.W., XX (1909), 379.

Syn.: *L. subdigitata* Trin. ex Steud (1854).

L. decipiens (*R. Br.*) *Stapf* ex Maiden in Agric. Gax. N.S.W., XX (1909), 307. The figure in Agric. Gaz. N.S.W., XX (1909), 307, perhaps represents this species but suggests a mixture with *L. peacockii.*

L. peacockii (*Maiden et Betche*) *Domin* in Biblioth. Bot., LXXXV (1915), 379. Figd. Agric. Gaz. N.S.W., XV (1904), 925. The figure at l.c., 926 represents *Leptochloa dubia.*

Syn.: *Diplachne peacockii* Maiden et Betche.

Enneapogon *Desv. ex Beauv.*

E. avenaceus (*Lindl.*) *C. E. Hubbard* in Kew Bull., (1934),450. Figd. Agric. Gaz. N.S.W., IV (1893), 414, sub *Pappophorum avenaceum.*

Vice *Pappophorum commune* var. *avenaceum* (Lindl.) Maiden et Betche.

E. gracilis (R. Br.) Beauv., Agrost., (1812), 82, 161.

E. intermedius *N. T. Burbidge* in Proc. Linn. Soc. Lond., CLIII (1941), 67.

E. polyphyllus (*Domin*) *N. T. Burbidge,* l.c., 69.

E. flavescens (*Lindl.*) *N. T. Burbidge.* l.c., 74.

E. nigricans (*R. Br.*) *Beauv.*, Agrost., (1812), 82, 162. Figd. Agric. Gaz. N.S.W., II (1891), 26; Turner, Austral. Grasses, (1895), 44, sub *Pappophorum nigricans.*

Vice *Pappophorum nigricans* F. Muell., nomen illeg.

E. pallidus (*R. Br.*) *Beauv.*, Agrost., (1812), 82, 161.

E. pallidus var. brevisetus *N. T. Burbidge* in Proc. Linn. Soc. Lond., CLIII (1941), 80.

E. cylindricus *N. T. Burbidge*, l.c., 89.

Thellungia *Stapf.*

T. advena *Stapf* in Kew. Bull., (1920), 98.

Triraphis *R. Br.*

T. mollis *R. Br.*, Prodr., (1810), 185. Figd. Agric. Gaz. N.S.W., III (1892), 643; Turner, Austral. Grasses, (1895), 54.

Elytrophorus *Beauv.* Vice *Elythrophorus.*

E. spicatus (*Willd.*) *A. Camus,* based on *Dactylis spicata* Willd. (1801).

Syn.: *E. articulatus* Beauv. (1812).

Phragmites *Trin.*

P. communis *Trin.*, Fund. Agrost., (1820), 134.

Triodia *R. Br.*

T. mitchelli *Benth.* var. **pubivagina** *N. T. Burbidge* in Austr. Journ. Bot., I, No. 1 (1953), 151.

Triodia (*contd.*)—

T. mitchelli *Benth.* var. **breviloba** *N. T. Burbidge,* l.c., 149.

T. irritans *R. Br.* var. **laxispicata** *N. T. Burbidge,* l.c., 171.

T. scariosa *N. T. Burbidge,* l.c., 173.

T. basedowii *Pritzel* in Fedde Repert. Spec. Nov., XV (1918), 356.

Notochloe *Domin.*

N. microdon (*Benth.*) *Domin* in Fedde Repert. Spec. Nov., X (1911), 117. Figd. Agric. Gaz. N.S.W., VIII (1897), 605; Maiden, Manual of Grasses of N.S.W., (1898), 145.

Syn.: *Triodia microdon* (Benth.) F. Muell.; *Triraphis microdon* Benth.

Diplachne *Beauv.*

D. fusca (*L.*) *Beauv.,* Agrost., (1812), 163. Figd. Agric. Gaz. N.S.W., III (1892), 387; Turner, Austral. Grasses, (1895), 23.

D. muelleri *Benth.,* Fl. Austral., VII (1878), 619.

Eragrostis *Beauv.*

E. tenella (L.) Beauv. ex Roem. et Schult., Syst. Veg. II (1817), 576. Delete; not in N.S.W. The identity of the species figured in Agric. Gaz. N.S.W., XIV (1903), 607, is as yet uncertain.

E. trachycarpa (Benth.) Domin in Fedde Repert. Spec. Nov., IX (1911), 552.

Syn.: *E. nigra* var. *trachycarpa* Benth.

E. kennedyae *F. Turner* in Proc. Linn. Soc. N.S.W., XIX (1893), 535.

Vice *E. kennedyana* in error.

E. falcata Gaud. in Voy. Freyc., Bot., (1826), 408, t. 25.

Syn.: *E. trichophylla* Benth. Delete; not known from N.S.W. The specimen figured in Agric. Gaz. N.S.W., VIII (1897), 123; Maiden, Manual of the Grasses of N.S.W., (1898), 179, appears to be a species allied to *E. dielsii* but probably distinct.

E. leptocarpa *Benth.,* Fl. Austral., VII (1878), 644. Figd. Agric. Gaz. N.S.W., XV (1904), 148.

E. microcarpa *J. Vickery* in Contrib. N.S.W. Nat. Herb., I, No. 6 (1951), 339.

E. megalosperma *F. Muell. ex Benth.,* Fl. Austral., VII (1878), 644.

E. parviflora (*R. Br.*) *Trin.* in Mem. Acad. Petersb., Ser. vi, I (1831), 411. Figd. Agric. Gaz. N.S.W., III (1892), 149; Turner, Austral. Grasses, (1895), 26.

Vice *E. pilosa* (L). Beauv., which is, however, naturalised in N.S.W.

E. leptostachya *Steud.,* Syn. Pl. Gram., (1854), 279. Figd. Agric. Gaz. N.S.W., II (1891), 241; Turner, Austral. Grasses, (1895), 25; Breakwell, Grasses and Fodder Pl. N.S.W., (1923), 113.

E. molybdea *J. Vickery* in Contrib. N.S.W. Nat. Herb., I, No. 6 (1951), 338.

E. philippica *Jedwabnick* in Bot. Archiv., V (1924), 191.

Syn.: *E. brownii* var. *patens* Benth. is possibly this species.

E. brownii *Nees ex Steud.,* Nom. Bot., ed. ii (1841), 562. Figd. Agric. Gaz. N.S.W., XV (1904), 621; Breakwell, Grasses and Fodder Pl. N.S.W., (1923), 115.

E. elongata *Jacq.,* Eclog. Gram., (1813), t. 3. Figd. Agric. Gaz. N.S.W., XV (1904), 623; Breakwell, Grasses and Fodder Pl. N.S.W., (1923), 116.

Vice *E. diandra* Steud.

E. sororia *Domin* in Biblioth. Bot., LXXXV (1915), 399.

Eragrostis (*contd.*)—

E. costata F. Turner in Proc. Linn. Soc. N.S.W., XXX (1905), 91. Delete. Probably identical with *E. cilianensis,* a naturalised species.

E. laniflora *Benth.,* Fl. Austral., VII (1878), 648.

E. eriopoda *Benth.,* Fl. Austral., VII (1878), 648. Figd. Breakwell, Grasses and Fodder Pl. N.S.W., (1923), 120.

E. desertorum *Domin* in Biblioth. Bot., LXXXV (1915), 404.

E. setifolia *Nees* in Hook. Lond. Journ. Bot., II (1843), 419. Figd. Agric. Gaz. N.S.W., XV (1904), 147.

E. basedowii *Jedwabnick* in Bot. Archiv., V (1924), 186.

E. concinna (*R. Br.*) *Steud.,* Syn. Pl. Gram., (1854), 279.

E. lacunaria *F. Muell.,* First Gen. Rep., (1853), 20; Benth. Fl. Austral., VII (1878), 649. Figd. Agric. Gaz. N.S.W., IV (1893), 523.

E. dielsii *Pilger in Diels et Pritzel* in Engl. Bot. Jahrb., XXXV (1904), 76.

E. pergracilis *S. T. Blake* in Proc. Roy. Soc. Qld., LIX (1948), 154.

E. australasica (*Steud.*) *C. E. Hubbard* in Kew Bull., (1941), 26. Based on *Glyceria australasica* Steud. (1854). Figd. Agric. Gaz. N.S.W., IV (1893), 222.
Syn.: *Glyceria ramigera* F. Muell. ex Benth. (1878).

E. interrupta (*R. Br.*) *Beauv.,* Agrost., (1812), 71.
Syn.: *E. brownii* var. *interrupta* (R. Br.) Benth.

E. pubescens (*R. Br.*) *Steud.,* Syn. Pl. Gram., (1854), 279.

E. speciosa (*Roem. et Schultz.*) *Steud.,* l.c.

Ectrosia *R. Br.*

E. leporina *R. Br.,* Prodr., (1810), 186. Figd. Agric. Gaz. N.S.W., XIII (1902), 1009. This species has been recorded for N.S.W. by several authors, but there is no specimen from N.S.W. in the National Herbarium collections. A specimen at the British Museum of Natural History collected by Mueller is stated to be from N.S.W., but no exact locality is given.

Distichlis *Rafin.*

D. maritima Rafin. in Journ. Phyt., LXXXIX (1813), 104. Figd. Agric. Gaz. N.S.W., VIII (1897), 520; Maiden, Manual of the Grasses of N.S.W., (1898), 169. Somewhat doubtfully admitted to this Census on the evidence of a specimen from Lake Cudgellico, coll. J. L. Boorman.

Poa *L.*

P. queenslandica *C. E. Hubbard* in Kew Bull., (1934), 449.

P. lepida *F. Muell.,* Fragm., VIII (1874), 130.

P. nodosa Nees in Lehm., Pl. Preiss., II (1846), 105. Delete; not known from N.S.W.

P. fordeana *F. Muell.,* Fragm., VII (1873), 130. Figd. Agric. Gaz. N.S.W., IV (1893), 413.
Syn.: *Glyceria fordeana* (F. Muell.) Benth.

P. saxicola *R. Br.,* Prodr., (1810), 180. It is still very uncertain whether this species occurs in N.S.W.

P. tenera *F. Muell. ex Hook. f.,* Fl. Tas., II (1860), 124, t. 164.
Syn.: *P. caespitosa* var. *tenera* (F. Muell. ex Hook. f.) Benth.

P. affinis *R. Br.,* Prodr., (1810), 179.
Syn.: *P. caespitosa* var. *affinis* (R. Br.) Benth.

Poa (*contd.*)—

P. plebeia *R. Br.*, Prodr., (1810), 179.
SYN.: *P. caespitosa* var. *plebeia* (R. Br.) Benth.

P. caespitosa var. latifolia *Benth.*, Fl. Austral., VII (1878), 652. Figd. Agric. Gaz. N.S.W., IV (1893), 524.

Poa spp. The remainder of the native species of *Poa*, which have in the past been collectively referred to *P. caespitosa* Forst. f. (i.e., *P. caespitosa* Spreng., Mant. I, Fl. Hal. (1807), 33; Mem. Acad. Petersb., II (1807-8), 302, t. 8), have not yet been studied sufficiently to permit of their enumeration. It is even uncertain whether the true *P. caespitosa* occurs in N.S.W.

Glyceria *R. Br.*

G. dives (*F. Muell.*) *F. Muell. ex Benth.*, Fl. Austral., VII (1878), 659.

G. australis *C. E. Hubbard* in Kew Bull. (1934), 450. Figd. Agric. Gaz. N.S.W., II (1891), 121.
VICE *G. fluitans* (L.) R. Br.

G. latispicea (*F. Muell.*) *Benth.*, Fl. Austral., VII (1878), 650.

Puccinellia *Parl.*

P. stricta (*Hook. f.*) *Blom* in Acta Hort. Gotheburg, V (1930), 89.

Festuca *L.*

F. littoralis *Labill.*, Pl. Nov. Holl., I (1804), 22, t. 27.

F. hookeriana *F. Muell. in Hook. f.*, Fl. Tas., II (1860), 127, t. CLXV.

F. muelleri *J. Vickery* in Contrib. N.S.W. Nat. Herb., I, No. 1 (1939), 9. Figd. Agric. Gaz. N.S.W., VII (1896), 195; Maiden, Manual of the Grasses of N.S.W., (1898), 183, sub *Schedonorus Hookerianus.*

F. asperula *J. Vickery* in Contrib. N.S.W. Nat. Herb., I, No. 1 (1939), 12. Figd. Agric. Gaz. N.S.W., XV (1904), 245.
VICE *F. duriuscula* L.

F. eriopoda *J. Vickery* in Contrib. N.S.W. Nat. Herb., I, No. 1 (1939), 10.

F. plebeia *R. Br.*, Prodr., (1810), 178. A form allied to this species occurs in N.S.W.

Bromus *L.*

B. arenarius *Labill.*, Pl. Nov. Holl., I (1804), 23, t. 28, and var. *macrostachya* Benth., Fl. Austral., VII (1878), 661, are doubtfully native to N.S.W. Figd. Agric. Gaz. N.S.W., II (1891), 504; Turner, Austral. Grasses, (1895), 15.

Monerma *Beauv.*

M. cylindrica (*Willd.*) *Coss. et Dur.*, Expl. Alg., (1854-67), 214.
SYN.: *Lepturus cylindricus* (Willd.) Trin. Probably introduced.

Parapholis *C. E. Hubbard.*

P. incurva (*L.*) *C. E. Hubbard* in Blumea, Suppl. III (1946), 14.
SYN.: *Lepturus incurvatus* (L.) Trin. Probably introduced.

Agropryon *Gaertn.*

A. scabrum (*R. Br.*) *Beauv.*, Agrost., (1812), 102. Figd. Agric. Gaz. N.S.W., II (1891), 120.

A. scabrum var. plurinerves *J. Vickery* in Contrib. N.S.W. Nat. Herb., I, No. 6 (1951), 342.

A. velutinum *Nees* in Hook. Lond. Journ. Bot., II (1843), 417. Figd. Agric. Gaz. N.S.W., X (1899), 141.

A. retrofractum *J. Vickery* in Contrib. N.S.W. Nat. Herb., I, No. 6 (1951), 340. Figd. Agric. Gaz. N.S.W., VII (1896), 78; Maiden, Manual of the Grasses of N.S.W., (1898), 191.
VICE *A. pectinatum* (Labill.) Beauv., a Tasmanian species.

An Enumeration of Plants in the Albury, Holbrook and Tumbarumba Districts of New South Wales

E. J. McBarron, B.V.Sc.

Introduction

This enumeration of the plants of the Albury, Holbrook, Tumbarumba and Upper Murray districts of New South Wales is based primarily on the specimens of my personal herbarium. Information concerning distribution, habitat and flowering times of the species has been added wherever this is available. Particular attention has been paid to the indigenous and naturalised flora and less attention to ornamental and horticultural plants. The area concerned is of approximately 3,300 square miles and falls within the South-West Slopes and Southern Tablelands divisions of New South Wales. Minor attention has been given to the agrostology, and to the incidence of poisonous and injurious plants, whilst records of naturalisation or incidence prior to settlement are incorporated where such are available.

The work represents the result of observations made during eight years residence, firstly at Holbrook and later at Albury during which time an herbarium was formed. Collections, for the most part, have been made from roadsides, waste lands and settled areas. Many parts of the area, especally mountain fastnesses and forest lands, have had only desultory attention. Consequently search in the more remote parts of the region would undoubtedly bring many additional species to light, or greatly extend the known distribution of others.

The success with which individual species are collected varies directly with one's experience and knowledge of the particular group and of the points of difference between closely related species. Many of the smaller species, though noticeable in the short ground-cover of early spring, may, within the short period of a fortnight, become quite inconspicuous amongst the longer herbage. Thus small plants of the nature of *Rutidosis, Galium, Ophioglossum* and *Crassula* are often overlooked, and their incidence and distribution will remain inadequately appreciated until a special study can be made of each.

The treatment covers some 500 indigenous plants, 258 naturalised aliens, and 350 cultivated plants selected either as ornamental trees and shrubs or common garden plants cultivated within the area. Many of the latter have been selected for notice on account of their tendency to spread. Complete coverage of garden plants has not been attempted.

Determinations, for the most part, were obtained from the National Herbarium of New South Wales, Botanic Gardens, Sydney. A large number of Cyperaceae were determined by Mr. S. T. Blake of the Queensland Botanic Museum and Herbarium, Brisbane. The bulk of material was submitted in duplicate, especially of the more uncommon species, and it is presumed that representative numbers have been retained by these institutions. Specimens are cited in accordance with serial numbers of the Accession Book of my herbarium and duplicate material bears the same numbers.

Acknowledgments.

It would be difficult to pay adequate tribute to all those who have assisted, directly or indirectly, and given encouragement in the preparation of this paper. They include landholders and local government authorities as well as professional botanical

workers. Special tribute is paid to Mr. R. H. Anderson, Chief Botanist and Curator, National Herbarium of New South Wales, and members of his staff, Misses Vickery, Tindale, Garden and Ford, and Messrs. Mair, Johnson, Chippendale and Rupp, for the determination of large numbers of specimens submitted over several years. Miss J. W. Vickery has been very helpful in valuable criticism of the manuscript and suggestions as to the presentation of the material. Mr. S. T. Blake has been generous in determining specimens of the Cyperaceae. I am indebted to Mr. N. Lothian of Adelaide for determinations of *Wahlenbergia* specimens. The Science and Industry Fund of the Commonwealth Scientific and Industrial Research Organisation, Melbourne, defrayed the cost of typing the manuscript and materially contributed, by this means, to the completion of the work.

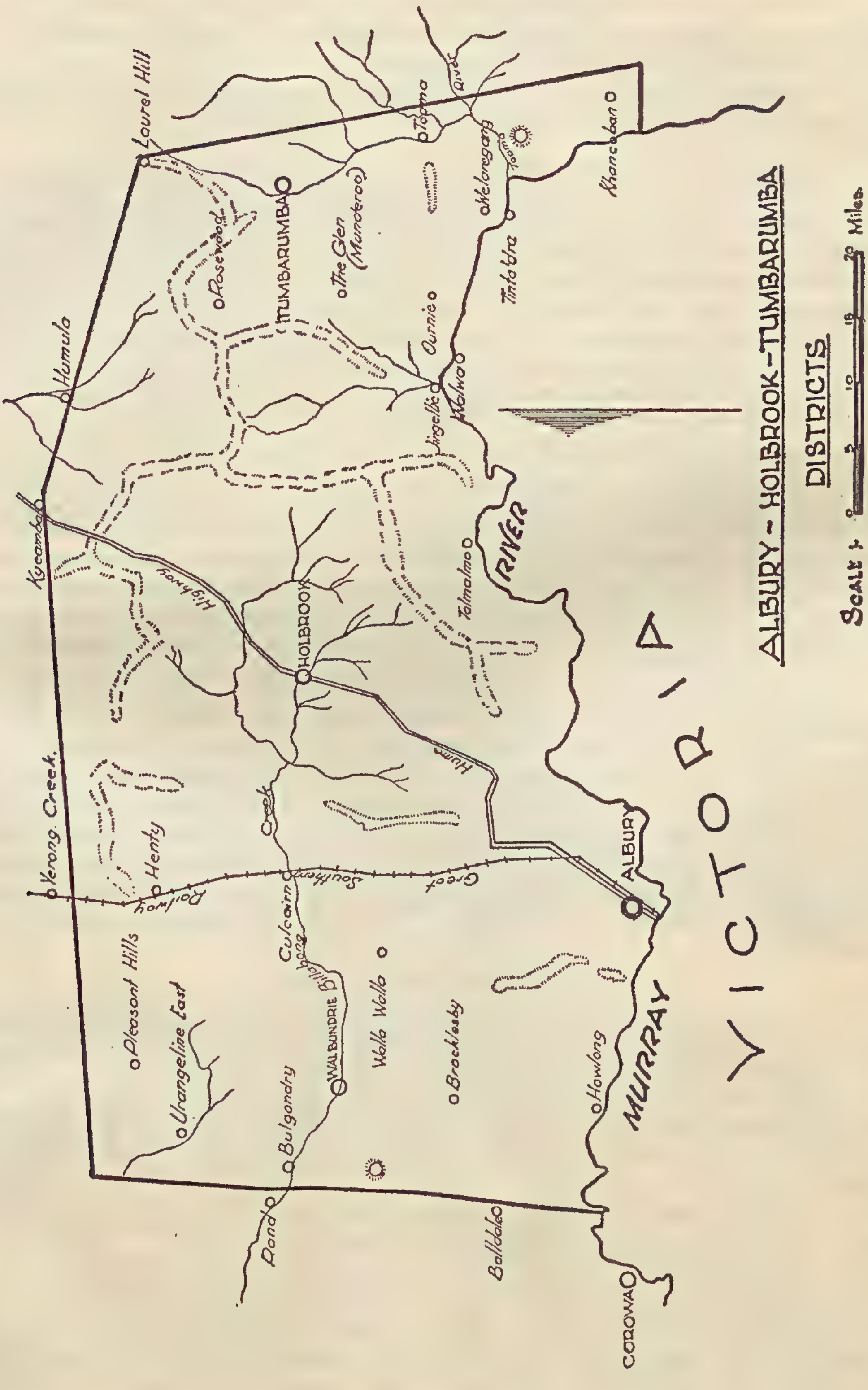
PREVIOUS BOTANICAL INVESTIGATIONS OF THE AREA.

Little attention has previously been given to the flora of the region other than by collectors on occasional visits; their findings have been inaccessible to me. Cambage (1904) treated the northern portion of the area mainly from the point of view of Eucalypts and Turner (1904) gave little information as to exact localities. Morland (1949) outlined the broad ecology of the Upper Murray Valley. Valuable records on the flora of the adjacent North-Eastern Victoria are available in the works of Williamson (1929), Nicholls (1931) and Ewart (1930).

Quite an amount of information is available in the files of the Border Post, from 1856 to 1900. This newspaper was printed at Albury and the early copies are lodged at the Albury Museum. It is recorded therein (10.1.1874 and 30.5.1874) that Baron von Mueller visited Albury in 1874 en route to the Australian Alps with the objective of getting " a glance at the vegetation of the Hume River district and compare[ing] it with that of the Mitta Mitta." " It may be mentioned that when Baron Mueller was passing along the upper Hume River on the Victorian side, to facilitate his journey, he traced the real *Eucalyptus globulus* into New South Wales territory, which was its northerly locality, not having met it since he left the Buffalo Ranges. He also discovered both on New South Wales and Victorian territory an entirely new tree, probably of medicinal importance, the *Bertya Finlayi,* named in honour of Mr. Finlay of Towong, who provided him with supplies and horses. The Tasmanian sassafras tree was also on this occasion first traced into New South Wales. True, the Baron found it in the east Gippsland regions years ago. The native pepper tree was also found for the first time in this colony. A new feature in the lower alpine brooks was discovered in the Crimson Correa, growing to a small tree, combining all the brilliancy of the so-called native fuchsia with magnificent habit and dark shining foliage. . . . . Several new plants were also found on the Granite Ridges, bordering on the station of Mr. Watson; these plants were not in flower at the time. The magnificent tall *Grevillea Victoriae,* which was discovered by Baron Mueller on the Buffalo Ranges in 1853, was on this occasion traced to the base of Mt. Kosciusko." A bulletin issued by Mueller in the Border Post of 3.10.1874 fixes the dates of the journey from 6th to the 26th January, 1874 and states "Cursorily as this journey necessarily was . . . . it leaves, at all events, the vegetation of the Hume River districts no longer unrepresented in our collections."

TOPOGRAPHY OF THE REGION AND DIVISIONS.

The total area considered in this enumeration is approximately 3,300 square miles and comprises the county of Hume and parts of Selwyn, Goulburn, Urana, Mitchell and Wynyard. The shires of Culcairn and Holbrook are included together with parts of Coreen, Tumbarumba, Urana and Lockhart. The Hume (Holbrook) Pastures Protection District is included except for the extreme eastern portion whilst the whole of the Albury district is covered.


ALBURY - HOLBROOK - TUMBARUMBA
DISTRICTS
Scale
0
5
10
15
20 Miles
Laurel Hill
Humula
Kyeamba
Yerong Creek
Henty
Pleasant Hills
Urangeline East
Bulgandry
Rand
Walbundrie
Culcairn
Billabong
Creek
Walla Walla
Brocklesby
Balldale
Howlong
Corowa
Albury
Holbrook
Tumbarumba
Rosewood
The Glen
(Mundaroo)
Tooma
Tooma
River
Khancoban
Tintaldra
Welaregang
Ournie
Jingellic
Walwa
Talmalmo
Hume
Highway
Southern
Great
Railway
Murray
River
VICTORIA

According to the broad division of the State made by Anderson (1947) the major part of the region falls within the South-West Slopes with a small portion referable to the Southern Tablelands.

For purposes of this enumeration I prefer to recognise three local divisions, viz. the Upper Murray Valley, the Southern Mountain Region and the South-West Slopes.

The Upper Murray Valley consists of steep-sided valleys interspersed with narrow river (flood plain) flats, billabongs, anabranches and meanders of the Murray River. Hills (1946) refers to the border of the Murray Valley near Albury as "alluvial fans". Where the Murray River emerges from hilly country and commences to flow over neighbouring plains there is a sudden decrease in gradient. From Bringenbrong where the Murray is formed by confluence of the Indi and Swampy Plain Rivers at an altitude of 1,000′ there is a fall to 500′ at Howlong over a distance of 100 miles. This region includes flats of relatively high fertility with grassland, the vegetation of the floor is predominantly marshy and aquatic, and there are some rocky outcrops with scrub especially on the upper reaches of the valley.

The Southern Mountain Region lies east of a meridional line through Holbrook. This division differs from the Southern Tablelands division of Anderson (1947) in that it includes the foothills ascending to the tableland on the east and the ascent from the Murray Valley in the south. The division line follows the 27″ isohyet. The eastern boundary excludes the Australian Alps but includes the mountainous regions of Paddy's River, Maragle (3,000′) and Laurel Hill (3,300′) and descends to the Murray River at Khancoban (1,000′). A large proportion is non-arable and unsettled including considerable areas of State Forests and Crown Lands. Elevations vary between 800′ and 3,300′.

The South-West Slopes region includes the eastern portion of the southern wheat belt and extends west from the meridional line through Holbrook to the Western Plains. Here the valley floors become broader and merge into undulating country to the west. The altitude varies from 500′ to 900′, e.g. Albury 534′, Rand 517′, Pleasant Hills 774′, except for isolated peaks, spurs and hills rising to 1,000′ or 2,000′, e.g. Table Top Mountain, Goombargama Hill, Jindera Gap and Yambla Range. It is in this region that settlement has been longer established and is more intensive, so that less of the original flora remains. Excluding a narrow strip of river flats along the Murray from Albury to Howlong, fully 80% of the remainder lies within the wheat belt.

GEOLOGY, SOIL TYPES AND CLIMATE.

The geology of the southern fringe has been discussed by Joplin (1944, 1947). Sussmilch (1911) identified most of the formations of the area as Silurian sedimentary rocks together with igneous granites and porphyrites. Part of the Tumbarumba district consists of basalts, but the Murray Valley Report (1940) indicates that the exact age relationships of the basalts in the Rosewood and Tumbarumba regions are not clear. A more recent treatment of the Tumbarumba area is given by Vallance (1953).

The soils of the area show a transition from the red-brown earths of the wheat belt to the podsolised soils of the higher rainfall areas to the east.

The average annual rainfall varies between 20 inches on the western border and 40 inches in the east including the Southern Tableland division. The whole area lies within the winter rainfall belt of southern New South Wales. Warren (1948) indicates that the percentage of winter over summer rainfall ranges from 20 to 40 per cent., the latter occurring along the Murray River Valley.

With the variation in altitude there is a corresponding range of temperatures.

SETTLEMENT AND AGRICULTURAL PURSUITS.

The Murray River was discovered by Hume and Hovell in 1824, but settlement did not commence until 1835 at Mungaboreena near the present site of Albury. From this time onwards settlement developed slowly until the 1850's. Reviewing the history of the Albury district, the Border Post of 7.8.1875 indicated that the energy of the early settlers was devoted to the cultivation of cereals. The Border Post Almanac of 1877, p. 44 gives as reasons for the slow development of Albury from 1846 to 1856: "The blacks were troublesome, the roads were for the most part impassable, and the rivers at certain seasons unfordable". It was not until the passing of the Land Act of 1861 that land was opened up for selection. A series of articles on the eastern Riverina in the Border Post of 1877 to 1878 describes the history of individual stations in existence at that time.

A correspondent in 1875 from Ten Mile Creek (now Holbrook) stated that it is "only within the past seven years that any progress has been made in this district with agricultural pursuits", and asserted that areas under cultivation were reverting to grazing. Tumbarumba in 1875 was a town of 175 people with a district population of 850, chiefly depending on alluvial gold-mining and agricultural pursuits.

An official report submitted on the proposed railway line from Yambla near Gerogery through the Upper Murray Valley to Welaregang in 1892 described the settlement over this distance of 76 miles as consisting of 100 holdings with an approximate population of over 500. Settlers made their living by grazing small numbers of sheep or cattle, farming operations being confined to the production of hay for their own use. There were no sawmills, the timber being unsuitable.

The Great Southern Railway Line between Albury and Sydney was opened in 1881, and contact between Albury and Melbourne by rail was established in 1883. Settlement during the period 1860 to 1900 was characterised by the subdivision of the large holdings of thousands of acres and the development of more intensive agriculture.

To-day the Western Slopes division is predominantly devoted to wheat and sheep-raising and is the most intensively cultivated. The Tableland division shows the greatest diversity of agriculture, viz. cereal crops, Eucalyptus-oil distillation, timber, vegetable growing, mixed grazing and dairying. Thousands of acres of non-arable forest land still remains to a large degree unsettled, but is utilised for occasional grazing leases. The resources and development of the division are dealt with in detail in a Report of the Survey Committee (1947).

INDIGENOUS VEGETATION PRIOR TO SETTLEMENT.

An attempt at reconstruction of a complete picture of the indigenous vegetation prior to settlement would in itself form a major project in botanical research, and would necessitate constant access to large public libraries, herbaria and archives of government departments; these facilities have not been readily available to me during the progress of this work. From collation of newspaper files and the reports of explorers and travellers one may attempt a cursory survey. Settlement with its associated fires and introduction of alien plants together with locust plagues and droughts has obscured the vista to the present day observer.

Upper Murray Valley. Referring to Hume and Hovell's diary, Andrews (1912) noted that the banks of the Murray (Hume) River at the present side of Albury were "thickly wooded, principally of blue gums of large growth and overgrown with vines of various kinds, fern, flaxplant, peppermint and kurrajong". The peppermint plant "seemed to surpass, both in odour and taste, the species generally produced in our gardens". The blue gums were the Murray Red Gum (*Eucalyptus camaldulensis*) and the vines either *Rubus parviflorus, Glycine clandestina* or *Hardenbergia violacea,* (more remote possibilities are *Convolvulus erubescens* or *Cuscuta australis*). The fern was the ordinary Bracken Fern (*Pteridium aquilinum*); the peppermint plant was most probably *Mentha diemenica* (q.v.) associated with *M. australis* since both grow at this site to the present day. The flax plant, in the light of present day evidence, was probably *Linum marginale,* though *Wahlenbergia consimilis* is also present, and the kurrajong was *Brachychiton populneum.*

"Proceeding downstream they were compelled from a continuous succession of lagoons and swamp to retire to higher land, about two miles from the river". A synthesis from the present day flora of this region suggests lagoons fringed by tall dense stands of *Eleocharis sphacelata,* larger *Juncus* spp., *Phragmites communis* and *Cyperus exaltatus,* the surface of the lagoons covered with the red, floating *Azolla* with the aquatic plants *Potamogeton, Ottelia, Alisma plantago-aquatica* and the early vegetative growth of *Jussiaea repens.* The same spot was described by an observer in 1891, as "lagoons and backwaters beautiful with vesture of red water weed and lily leaf". Skirting the fringe of the lagoons would be *Myriophyllum propinquum, Chamaeraphis squarrosa, Paspalum distichum* and *Rorippa islandica* and, on the higher ground between lagoons, *Eragrostis brownii, Polygonum prostratum, P. hydropiper, P. lapathifolium* and *Lythrum salicaria.* It is also conceivable that species now uncommon were present in considerable quantities, e.g. *Eulalia fulva, Isachne australis* and *Cotula coronopifolia.* This same general pattern can be seen along the course of the Murray River to the present time with the addition of taller species, e.g. *Scirpus maritimus, Typha* spp.

Hovell (1921), quoting from Captain Hovell's diary, indicates that on the 16th. November 1824 the land was "low and level". Following the course of the Murray River it was impossible to cross, "as all between the river and the high land are lagoons and swamps to the distance of about two miles back". This confirms the description given by Andrews (l.c.). Downstream from the present site of Albury the timber was blue gum (*Eucalyptus camaldulensis*) but the timber away from the river where the soil is not good was box tree (probably *E. bridgesiana* or *E. elaeophora*). Upstream from Albury for three miles there was a fine level box forest on the opposite side, but about 10 miles upstream (near the present site of the Hume Weir), the country had a fine appearance. "In some places there is not more than half a dozen trees in a hundred acres". At this point on November 19th. 1824 the explorers travelled through grass "as high as their heads" (Andrews, l.c.). This grass was probably *Themeda australis* which even to-day is capable of tall rank growth at this site in favourable seasons. It is conceivable, of course, that the reference may have been to a member of the Cyperaceae.

Away from the river when passing Battery Mount (now Table Top), on the 13th and 14th November, the explorers found "fine open box country—the sloping hills covered with an excellent coat of grass, the box tree and others peculiar to that part of the country" (Hovell, 1921).

One might conclude that the primarily aquatic flora of the floor of the Murray River Valley in a qualitative sense has not undergone a great degree of change. The upper reaches of the valley were covered by open woodlands interspersed with occasional tracts of savannah grassland with few trees. The Murray Red Gum grew luxuriantly along the river and attained a large size. A paragraph in the Border Post of 28.3.1890 described one tree as "a perfect giant".

The Red Gum provided the fuel for Murray steamers in the period 1850-1870 and records indicate that huge piles of logs were assembled at each calling point along the river. A correspondent, describing a boat trip from Swan Hill to Albury, in May 1860 was compelled to "pull to the full, the river being so thickly timbered on either side as not to admit of sufficient wind to catch the sails". The abundance of Red Gum was also indicated by its use for tanning (Border Post, 13.9.1873).

South West Slopes Region. In this region the effects of settlement have been most evident. Most of the trees and shrubs have been cleared, and extensive cultivation of cereals undertaken. Occasional stock reserves and little-used roads or lanes retain a vestige of the original vegetation. The evidence would indicate that none of it exhibited the characteristics of that of the Western Plains of New South Wales but considered rather of open savannah woodlands with specialised local communities.

Hodgkinson in a report dated 1856 to the Surveyor General of Victoria on the Murray River district from Albury to the confluence with the Ovens River describes the country "as tracts of level box country" with "alluvial river flats and well-grassed forest hills of crystalline rock that extend to a considerable distance westward of Albury and gradually recede from the river as the distance from Albury increases". Howlong was recommended as an excellent site for a township "being contiguous to a very fine plain, clear of timber and on an open box forest of the best description backed by granite ridges".

A series of articles written by "Reporter" to the Border Post between 1877 and 1881 mention various parts of the region then undergoing settlement and cultivation. The 18 miles from Urangeline to Wallandool consisted of inferior country, being sandy, rocky and thickly timbered. At Urangeline "one lost sight of the everlasting plains and once more got into bush". Walla Walla was undergoing ringbarking and other improvements. Moorwatha, near Howlong, was characterised by more sheltered country but "of very dry appearance, all practically flat with principally stunted box timber" (1880), while the country between Howlong and Goombargana was thickly timbered. From Goombargana to Mahonga, a distance of 18 miles "tree ringing has been extensively carried on in this thickly timbered country which consists for the most part of bastard box (*Eucalyptus albens*), occasional and very thick pine scrubs (*Callitris glauca*) with here and there oaks (*Casuarina luehmannii*). "All the green-timbered country is bare, whilst the rung (i.e. cleared of tree cover), have a rich verdure of herbage". At Mahonga, near Rand, "the plains open out in long stretches with occasional clumps of timber". Mahonga Station at that time (1880) consisted of 227,000 acres of purchased land including the present site of Urangeline. It was reported that at Cookardinia in 1881 ringbarking was in progress at certain places and would go on until more rigorous measures were put in force to stop it. The correspondent added that ten years before "four-fifths of the whole district of Albury was one extensive box flat, but since that time, through the operation of the Land Alienation Acts of 1861 and 1875, improvements in the way of ringing, clearing, fencing, etc. have been made and at the lowest calculations have increased the stock carrying capacities of holdings one hundred per cent.

Parts of the Brocklesby district, particularly the site of the present township, have been described to me by present day settlers as having been covered with Wattle thickets (*Acacia difformis*), interspersed with Eucalypts and a fair proportion of Hickory (*Acacia implexa*). The clearing of these belts of thick scrub was not completed until well into the present century. It is probable that such scrubs were not general but localised; an example of this type of vegetation adjacent to the Pleasant Hills township has been preserved to the present day. Associated with this was the now rare Quandong (*Eucarya acuminata*) with a thick undergrowth of *Helichrysum bracteatum, Rhagodia nutans* and *Chenopodium pseudomicrophyllum.*

There was also a special type of marsh and aquatic flora associated with the large inland lagoons, Oil Tree Lagoon near Balldale, Dudal Comer Swamp near Henty, and the Walla Walla Swamp. These areas have either been drained or now only fill during wet seasons. All carried a rich fauna and achieved fame as duck-shooting centres in the early days of settlement. A report on the duck-shooting in April 1892 described the Dudal Comer Swamp as covering an area of about 5,000 acres, about four miles long by one and half miles wide, and mentions that many ducks shot were "lost in the long reeds". The consensus of current local opinion is that Dudal Comer was never a permanent swamp but filled during the late autumn and winter only to dry out by midsummer, showing a large seasonal rise and fall from a dry clay bed to a depth of eight to ten feet of water. This evidence is further supported by the presence of Nardoo (*Marsilea*) extending from the margin to the bed. As a result of extensive grazing and rabbit infestation together with an influx of alien plants only a vestige of the former luxuriant growth of *Eragrostis australasica, Cyperus gymnocaulos, Mariscus gunnii, Juncus,* spp., and *Phragmites communis* now remains.

The indications are that the grasslands were for the most part made up of *Stipa* and *Danthonia* species. *Digitaria* spp. and some of the Andropogoneae are now rare. Though the genus *Panicum* is still well represented, one suspects that it is less common than formerly since it is evident, at least to the veterinary scientist, that in the past two decades photo-sensitisation in sheep due to the ingestion of *Panicum effusum* and *P. decompositum* has undergone a steep decline until these diseases are now a rarity.

The herb stratum included a rich assortment of ephemeral Compositae, e.g. *Gnaphalodes, Rutidosis, Brachycome, Helipterum, Calotis, Craspedia, Toxanthes* and *Myriocephalus,* most of which are still well represented. However, larger forms, e.g. *Swanisona, Desmodium* and many of the Liliaceae, are becoming scarce. The shrub stratum has almost entirely disappeared over the area, e.g. most of the *Acacia* spp. (with the exception of *A. pycnantha*), *Hymenanthera dentata, Daviesia latifolia, D. genistifolia, Eutaxia empetrifolia, Dillwynia sericea, Templetonia stenophylla, Melichrus urceolata, Indigofera australis, Dodonaea* spp., *Hibbertia* spp., *Pimelea* spp. and *Stackhousia monogyna.*

Changes in the incidence of members of the Orchidaceae have been most noticeable, for areas such as the Albury City Area, known to have been rich in the genera *Diuris, Caladenia, Thelymitra* and *Pterostylis,* now show few survivors. Old residents have recognised the now rare *Diuris punctata* as having been common in grasslands of the Albury district some 30 years ago.

Amongst the Pteridophyta it has been noted that the Adder's Tongue (*Ophioglossum*) is absent from all soils treated with superphosphate of lime or cultivated for crops. The Maidenhair Fern (*Adiantum*) is now restricted to a few sheltered sites in contrast with the description of Devil's Glen situated near the Nail Can Hill, West Albury, as famous for its "maiden hair and other varieties of ferns—well worth a visit at this time of the year" (Border Post, 9.6.1893).

Southern Tableland Region. Here the change has been the least evident. Thousands of acres still remain as Crown Reserves and a large proportion of privately owned lands has not been cleared.

From newspaper articles of 1879 one learns that Mannus Station, first taken up some 40 years before, had undergone tree-ringing on all the comparatively level country near the Mannus Creek. Towards the Murray River near "Mr. Bell's horse and cattle station . . . the ground is covered with springs oozing from the black soil and occasionally concealing itself beneath treacherous, rotten ground that has in some instances swallowed up a hapless horse that unguardedly galloped into its deceitful surface". This entry is of particular interest because this locality is at present known as The Glen (Parish of Munderoo, County of Selwyn) and is frequently cited in this enumeration. It has an elevation varying from 2,000′ to 2,500′, and the peat bogs and swamps are particularly rich in Sedges of which considerable collections have been made. The tree cover is composed of *Eucalyptus macrorhyncha* and Peppermint (*E. robertsonii complex*). Unimproved grasslands once showing a predominance of *Themeda australis* are now ousted by pastures improved with Subterranean Clover (*Trifolium subterraneum*). The swamps are characterised by the curious *Eleocharis atricha* together with *Kyllinga brevifolia,* several smaller species of *Scirpus, Pycreus globosus, Eriocaulon scariosum, Haloragis micrantha Cladium glomeratum,* larger *Juncus* spp., and *Schoenus apogon.* In the early days of settlement the district had the reputation amongst graziers of being a breeding ground of the liver-fluke (*Fasciola hepatica*) which accounted for large annual losses of sheep. The abundant *Schoenus apogon* became known as " Fluke Grass " since its presence was indicative of a habitat favourable for the proliferation of the fluke. The swamps themselves were probably covered by dense *Leptospermum* scrub though only isolated patches of this now remain.

Luke Gulson in 1886 in " Notes from my Diary on the proposed Upper Murray Railway Line " noted at Dora Dora (Talmalmo) that the valley of the Murray opens into extensive flats, the bank of the stream being lined with Willow, Wattle (*Acacia dealbata*) and Gum trees. In April 1886, during a journey from Tumbarumba along the Adelong Road to Bago Mountain he saw " the seven miles of winding road over steep little hills of deep volcanic soils ", and noted that " as one mounts higher the country is more thickly timbered with Mountain Ash (*Eucalyptus delegatensis*), White Gum (probably *E. viminalis*) and Urabba (Eurabbie or *E. bicostata*). Thousands and thousands of trees, straight as a rush, clean as a pipe stem, 60, 70 and 100 feet to the first limb. The forest here contains 37,000 acres, nearly all of which is timbered ". This description applies to this area equally well to-day despite extensive milling operations.

The Tunnel Road at Woomargama is described (Border Post, 29.11.1889) as " a monotonous road up and down a succession of rough rocky ranges, very scrubby, plenty of Grass Tree (*Xanthorrhoea australis*), Fern (*Pteridium aquilinum*) and a species of Wire Grass (*Aristida ramosa*) growing in thick tufts. In the gully, feed for sheep is plentiful. The timber is mostly Stringy Bark (*Eucalyptus macrorrhyncha* and Box (probably *E. bridgesiana*) mixed with peppermint and Wattle (*Acacia dealbata*) ".

FACTORS INFLUENCING THE COMPOSITION OF THE FLORA.

Rabbits, Locusts, Droughts and Bushfires.

As early as 1862 rabbits were mentioned in Albury papers for a complaint was lodged on the destruction of rabbits by dingoes, followed by suggestions for the protection of the rodent (Andrews, 1912). By 1868 the Border Post observed " at Albury rabbits run about the streets and backyards of the township, burrowing under the houses ". In 1883 the influx of rabbits near Howlong and properties lower down the Murray River was " alarmingly on the increase ", but even to the end of that year the reports indicated only a diffuse distribution of this pest. The 1890's saw a great increase in numbers with the consequent introduction of legislation designed to control them, but the spread continued until rabbit infestation constituted a serious problem throughout the region by 1900.

The effects of rabbit infestation are more manifest in the rough mountainous region, i.e. Southern Tablelands, which affords better harbour and increases the difficulty of control and eradication. Palatable species diminish and the pasture degenerates into a characteristic community in which the herb stratum is characterised by such species as *Poa caespitosa, Cheilanthes tenuifolia, Hypercium japonicum, Centaurium minus* and *Danthonia pilosa.* There becomes a preponderance of annual species, e.g. *Vulpia* spp., *Poa annua* and many of the smaller Cyperaceae, and weed pests such as *Inula graveolens, Echium plantagineum, Centipeda* spp., *Lythrum* *hyssopifolia, Argemone mexicana* and *Solanum nigrum* (*sensu lato.*). Other plants which flourish are *Parietaria debilis, Cryptostemma calendula* and *Erodium* spp. which appear to have little attraction for rabbits.

The rabbit was also largely responsible for the cessation of hedge planting. Emigrants of European descent, desirous of recreating the hedgerows of their native land, planted such species as *Maclura pomifera, Rubus vulgaris, Ulex europaeus, Lycium ferocissimum, Crataegus* spp. and the native *Acacia armata* for this purpose, and hedges became a feature of pioneer homesteads and holdings. However it was soon found that such hedges provided excellent harbour for rabbits.

The effects of locusts, droughts and bushfires are less obvious. Andrews (1912) records that a plague of grasshoppers caused widespead loss throughout the Albury district in 1889. Entries in the Border Post during December 1889 describe numbers of locusts flying about the streets of Albury. At Howlong, Bungowannah and other agricultural areas the pests were becoming numerous at that time. By mid-December 1890 columns of insects moving at the rate of a few miles in 24 hours passed over Hovell on the Urana Road, and horses would not face the flying horde. Everything green was attacked and many wheatfields were denuded of every thing but their heads. At Wallandool Station the locusts completely destroyed a large potato field, even attacking the tubers not covered by earth.

Droughts have also been in evidence since the early days. Andrews (1912) indicates that crops of hay were grown in 1837-8 on the beds of the lagoons at Wodonga. In 1844 a great flood was experienced and the long drought broken. A result was that cultivation was undertaken on a larger scale to support local wants. The year 1877 was noted for months that passed without a drop of rain. Thousands of sheep and cattle perished for want of water and many settlers were driven to the verge of ruin. The Border Post Almanac of 1879 recorded a complete breaking of the 1877-8 drought followed by luxuriant pastures.

Droughts are associated with the importation of fodder, a not inconsiderable factor in the spread of weeds. During 1889, as a result of a scarcity of cereals, a farmer near the head of the Murray River purchased 300 bags of New Zealand oats, a medium for the introduction of aliens (Border Post, 2.7.1889). The introduction of *Raphanus raphanistrum, Physalis* sp., *Emex australis* and *Alternanthera repens* is considered to have been effected by this means.

There are frequent records of bushfires in the early days of settlement. On Black Thursday, 6th. February 1851, practically the whole of the Riverina was swept by fire. In 1868 the year closed amid great depression and drought, the heat being excessive. December 24th. recorded 115 degrees F. in the shade. Bushfires were numerous and extensive on Christmas Day, the Albury Common and hills around Albury being burnt. Again, in 1878 a great heat wave occurred and bushfires were seen in all directions (Andrews, 1912).

The Border Post Almanac for 1889 records a destructive fire which swept the Walbundrie, Dudal Comer and Walla Walla districts in 1888. In the same year a fire at Morebringer caused considerable damage to settlements and total destruction of the Welaregang homestead. Fires at Mahonga in January 1893 caused great losses and later extended to Culcairn and Mittagong. January 1952 was remarkable for a particularly disastrous fire which swept over the Holbrook district with total destruction of the herbage cover and heavy losses of timber.

Stock Traffic, Commerce and Communications.

Within the area stock movements show pronounced trends. There is a seasonal traffic to and from the Snow Lease Areas of the Alps between March and November. A large proportion of these stock are local or from adjoining regions in Victoria but a considerable number come from western New South Wales.

Stock quarantine regulations prohibit the introduction of cattle from Queensland to Victoria unless they have spent a period of 180 days (formerly 90 days) in New South Wales. Consequently the area sustains a heavy influx of Queensland store cattle held on agistment. This movement provides opportunity for the introduction of weeds and other plants. The isolated infestations of Crownbeard (*Verbesina encelioides*) are attributed to this source.

Local traffic of stock has been responsible for the dissemination of St. John's Wort (*Hypericum perforatum*) from the Tumbarumba district to other centres. The spread of Paterson's Curse (*Echium plantagineum*) from its nucleus at Cumberoona near Bowna is related to the fact that it lay on the main stock route from the Upper Murray Valley, and to-day the evidence of its spread by stock along routes and on stock reserves is most obvious. The presence of alien plants around saleyards is further evidence of the part played by stock in their spread. In this regard one might cite the distribution in the area of *Tribulus terrestris, Emex australis, Boerhavia diffusa, Ibicella lutea* and *Proboscidea jussieui.* Examination of manure plats in grassland suggests that many of the smaller plants are spread following upon ingestion, e.g. *Moenchia erecta, Trigonella ornithopodioides, Schismus barbatus, Trifolium scabrum, T. hirtum, Romulea minutiflora* and *Soliva stolonifera,* which has probably also contributed to the very widespread nature of the adventive species *Juncus capitatus, Cicendia quadrangularis, Sherardia arvensis, Parentucellia latifolia* and *Spergularia rubra.*

Railways are not inconsiderable agencies in the dissemination of weeds. In the present enumeration the following amongst others are attributed to this source: *Paspalum urvillei, Asphodelus fistulosus, Oenothera* spp., *Linum gallicum, Imperata cylindrica* var. *major* and *Sisymbrium irio.*

Aspects of Human Sociology and Plant Geography.

Pulleine (1935) points out that wherever there is a movement of race there is a corresponding transportation of food plants, fruits and cereals. During early settlement the following factors may have influenced the introduction of plants either desirable or undesirable.

The Germans who settled about 1850 came from South Germany and took chiefly to wine-growing. They were experienced vignerons and in a short while were followed by 300 of their countrymen and every year added to their numbers.

The Land Act of 1861 opened up large tracts of land for selection and drew many thousands from South Australia and Victoria to settle in the Riverina (Border Post, 7.8.1875). Many of these were North Germans, who developed the wheat belt of the region. The North Germans have always maintained a close liaison with their kinsmen in South Australia, at first by way of the Murray River and later by land routes. Commerce followed communications with the result that seeds and plants were exchanged with the new settlers, and this has continued into succeeding generations. There is evidence to indicate that the following plants entered the area from South Australia: *Inula graveolens, Echium plantagineum, Homeria collina, Phyla nodiflora, Allium triquetrum, A. neapolitanum* and a number of others.

It seems likely that transport of alien plants could also have occurred in the ballast of river boats. The river trade between Albury and South Australia reached its peak in the early 1860's but rapidly declined after the Victorian extension of the railway to Echuca in 1864 and to Wodonga in 1874 (Holmes, 1948).

Settlement was hastened by the advent of gold-miners when in 1851 gold was discovered at Black Range (now Lavington) near Albury and later in other areas such as Bulgandry, Jindera, Carabost, Ournie and Tumbarumba. The growth of mushroom populations almost overnight caused the clearing of much of the vegetation and the inevitable destruction of the indigenous flora.

Horticulture and Arboriculture.

The histories of individual species of trees, shrubs or herbs are given in the enumeration where such are available.

The vine was cultivated from 1851, and subsequently developed into an important industry in the district. Wheat-growing dates from the 1840's together with the growing of other cereal crops such as oats, barley and rye. Tobacco was grown until the turn of the century when it was limited by disease and unsuitable climate. In the period of early settlement experimental plantings of flax, sugar cane, sugar beet, cotton, opium poppy, mulberry trees for sericulture and a number of other plants were undertaken with little success.

The Border Post of 18.4.1857 refers to an exhibit at a local horticultural show of peaches, grapes and quinces, "Holcus saccharatus", a variety of skinless barley, a few pomegranates, some rhubarb and pie melons, and later (28.11.1857) of strawberries and cherries.

On 1.2.1860 it was recorded that the crops and yields of the district were: wheat 20 bushels per acre, oats 30, barley 25; rye, potatoes, melons and cucumbers were also cultivated. Experimental cultivation was being undertaken of *Sorghum saccharatum*, Imphee, hops, cotton, lucerne, *Trifolium incarnatum,* white and red clover, English and Italian rye grass and other grasses. Oranges were in cultivation by 1861 (Border Post, 20.7.1861).

Up to 1900 and even later the agricultural columns of local papers often recommended the cultivation of economic plants without prior knowledge of their suitability for the region. Many plants were introduced as a result. In later years experimental plantings of new introductions have continued to bring plants into the area.

An indication of the plants which were being introduced to Albury gardens may be obtained from lists of plants advertised for sale in the Border Post issues of 1.7.1863 and 6.6.1883.

The present excellent Albury Botanic Garden was initiated about 1860 (see Border Post, 1860), but little was done towards its development until 1879 when laudatory notices began to appear in Albury papers concerning the laying out and planting of the gardens, "which were already making an agreeable change from the dreary camping ground, which previously occupied the site". A Photo-Albury review in the Border Post of 1.12.1889 refers to the botanic reserve "well provided with carefully labelled indigenous and imported plants, trees, and shrubs". The curator was Mr. John Howard, "who has considerable experience as a botanist and nurseryman". (See also Border Post of 24.8.1889 and 22.9.1893, and Andrews, 1912.)

Another arboretum of exotic trees is the Jephcott plantation on the bank of the Murray River near Welaregang. Spread over several acres there is here a fine assortment of conifers, oaks, elms, beeches and ornamental plants from all parts of the world. Baron Ferdinand von Mueller consistently forwarded seeds and plants for trial to the Jephcott family (the late Sydney Jephcott, personal communication).

A correspondent to the Border Post of 11.1.1871 remarks on the need of trees in Albury streets. Early plantings are recorded in the issues of 1.8.1875 and 30.8.1879, whilst a review of Albury in 1893 mentions over 2,000 street trees, and 'Telemachus' in his book* gives a picturesque description of the horticulture and arboriculture of the town about the 1890 period. To-day the city of Albury has some 5,000 street trees.

CONVENTIONS USED IN THE CITATION OF SPECIES.

The terms "abundant", "common", "frequent" and "rare' as used in this work are not to be taken as having any mathematical precision. The term "common" is to be interpreted as indicating that a species is present in sufficient quantity to allow several plants to be found without lengthy search. The other terms have been used relative to this.

Exact "flowering time" (abbreviated as *fl.*) is difficult to ascertain in many families. In grasses and sedges, for example, strictly it would mean the time of actual extrusion of the anthers and dispersal of pollen. In the following enumeration I have included under "flowering time" any period at which all the floral elements may be seen on the dissection of a flower, even though these parts may show senescence. Many of the Gramineae, Cyperaceae, Juncaceae and other families do not adhere closely to seasonal periods but appear to be partially subservient to climatic conditions. A mild winter may result in the flowering of many grasses to a small degree from autumn to spring, yet the same species may exhibit its main flowering period during spring and summer. In general, therefore, I have recorded the main, and more important subsidiary periods rather than the flowering of a very small proportion of individuals at unusual times.

In this Enumeration, if the name of a family, genus or species is not preceded by one of the following symbols, then that group is native in the Area. The significance of the symbols is as follows:

* not native in Australia (including Tasmania); naturalised in the Area.
† not native in Australia; cultivated in the Area.
‡ doubtfully native in Australia; naturalised or native in the Area.
§ native in Australia; only cultivated in the Area.
‖ native in Australia; naturalised in the Area.

PTERIDOPHYTA

LYCOPODIALES

ISOETACEAE

Isoetes *L.*

I. drummondii *A. Br.* "Quillwort". 5644, railway line 4 miles N. of Gerogery, rosettes in the mud at the bottom of deep ditches, shaded by tall marshy herbage, 28.10.1951; 5905, 3 miles S. of Gerogery, rooted in mud, depth of railway ditch, under *Juncus* spp. subgenus *Genuini*, 24.10.1952; 5936, Gerogery Rd., Jindera, in rapidly drying mud of roadside, semi-permanent swamp under *Juncus* spp. subgenus *Genuini*, 7.11.1952. Recorded, No. 5931 Wodonga Rd., 1½ miles N. of Beechworth (N.E. Vic.), in moss bed of roadside on dripping granite rocks under *Calytrix tetragona* scrub, 2.11.1952.

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* 'Albury', John Sands, Sydney, not dated. The Border Post Almanac, 1892, p. 71 probably refers to this: "a handsome book giving a short history of the town of Albury with a number of photographs of the different sights of the town . . ."

I. humilior *F. Muell.* 5970, Mahonga, 8 miles N.W. of Rand, in mud of claypans, 16.11.1952; 6034, Howlong Rd., Balldale, in mud of marshy areas off roadside, 3.12.1952; NSW. No. P2188, Wallandool, near Urangeline, in roadside ditch forming small colonies under *Juncus* spp. subgenus *Genuini*, M. Tindale and E. J. McBarron, 27.10.1952.

All of the above collections of *Isoetes* spp. are fruiting.

OPHIOGLOSSALES
OPHIOGLOSSACEAE
Ophioglossum *L.*

O. lusitanicum *L.* ssp **coriaceum** (*A. Cunn.*) *Clausen.* 2120, The Glen, Tumbarumba, about 2,300 ft., plentiful in open forest land, 3.10.1948; 2119, Lankey's Creek, sparingly distributed on grassy creek bank, 3.10.1948; 4998, Talmalmo, patches under scrubland in moister parts, 2.10.1950; 4951, Alma Park, ca. 8 miles N. of Walla Walla, in grassland, 26.9.1950; 5680, Cemetery Reserve, Henty, mixed with marsh flora in moist clay of margin of inflow to stock dam, 9.11.1951; 4897, 5 miles N. of Henty, 22.9.1950; 5521, Showground Reserve, Culcairn, 31.7.1951; 5522, Ryan, near Henty, 3.8.1951; 5600, 5939, Bake's Reserve, Gerogery, common in swamp, 12.10.1951, 7.11.1952; 1988, Monument Hill, Albury, large patch on bare, open, hard ground, 12.9.1948. All the above specimens fertile; fruiting mainly Sept.-Oct., as early as July, rarely to April.

Widely distributed over the area and relatively common though often localised as colonies. Present in moist spots of natural grasslands unimproved by superphosphate of lime and inconspicuous amongst other herbage. Observations suggest an extended sporing period since only a small proportion of plants within a colony, are in fruit at a given time.

FILICALES
MARSILEACEAE
Pilularia *L.*

P. novae-hollandiae *A. Br.* 5694, 5881, Bulgandry Reserve, Bulgandry, 12.11.1951, 16.9.1952; 5710, 5893, 2 miles S.E. of Balldale, 19.11.1951, 21.10.1952; 5714, 4 miles E. of Walla Walla, 20.11.1951; 5698, Wallandool, near Urangeline, 2.11.1951; 5886, Munyabla Rd., Henty, 26.9.1952; 5688A, Cemetery Reserve, Henty, 9.11.1951; 6005, Mahonga, 8 miles N.W. of Rand, Urana Rd., 16.11.1952; 6006, Lake Urana, 4 miles S.W. of Urana, 16.11.1952; 6007, Howlong township, 28.10.1952; 5890, Mate Street, Albury, 5.10.1952; 5889, 3 miles N.W. of Walbundrie, 8.10.1952.

These collections represent the only specimens of *P. novae-hollandiae* from New South Wales in the National Herbarium, Sydney. This species is found in roadside pools and on the margins of swamps.

Marsilea *L.* "Nardoo"

Widespread in swamps at elevations less than 1,000 ft. Fruiting irregular.

Marsilea angustifolia *R. Br.* 2584, 3285, 3286, 3198, 2770, 2771, 2772, 2773, 4444-5, Bulgandry Reserve, Bulgandry, 15.11.1948, 6.5.1949, 6.5.1949, 29.3.1949, 9.12.1948, 9.12.1948, 9.12.1948, 9.12.1948, 9.2.1950; 3276, 5 miles S.E. of Urangeline Railway Siding, near Henty, 26.4.1949; 2600, northern extremity of Oil Tree Lagoon, Balldale, 19.11.1948; 1159, Corowa Rd., Albury, 16.10.1947.

Marsilea drummondii *A. Br.* sens. lat. 2566, Corowa Rd., about 2 miles from Rand, 15.11.1948; 2784, Corowa Rd. Rand, 13.12.1948; 2599, N. of Oil Tree Lagoon, Balldale, 19.11.1948; 2604, Howlong, 19.11.1948; 5590, Mulwala, Corowa Rd., 7.10.1951; 5576, Rand, Walbundrie district, 8.10.1951.

POLYPODIACEAE

Nephrolepis *Schott*

†**N. exaltata** (*L.*) *Schott.* 4374, Albury Botanic Gardens, cultivated as potted fern, 21.1.1950.

Pteridium *Gleditsch ex Scopoli*

P. aquilinum (*L.*) *Kuhn* var. **esculentum** (*Forst. f.*) *Kuhn.* "Bracken Fern". Widespread over the area but commonest at higher elevations of the tableland area. Abundant at Lankey's Creek, Wantagong, hilly country adjacent to Holbrook, throughout the Tumbarumba district, Tooma, Rosewood, Carabost, Little Billabong, i.e., areas over 1,000′

Uncommon in the wheat belt, i.e., the western half of the area, but present along the Murray River banks from Albury to Howlong and along both sides of the Upper Murray River Valley. Produces bracken fern poisoning in livestock in parts of the Tumbarumba district and at Lankey's Creek.

Anogramma *Link*

A. leptophylla (*L.*) *Link.* 3765, Monument Hill, Albury, cleft between dripping rocks at base of old stone quarry, 12.10.1949; 3996, Carboona Gap, Tumbarumba, under rocks, damp spots with mosses, 6.11.1949.

Adiantum *L.*

A. aethiopicum *L.* "Common Maidenhair Fern". 5465, Munderoo West Creek, Wolseley Park, shaded moist spots along creek banks, 27.12.1950.

Maidenhair ferns are widely distributed in regions over 1,000′ in the area.

Cheilanthes *Sw.*

C. tenuifolia (*Burm. f.*) *Sw.* 1296, Carboona Gap, Tumbarumba, plentiful on rocky bank, 26.12.1947; 3169, 3170, Monument Hill, Albury, plentiful, 20.3.1949.

Widespread and common, especially on drier sites; a hardy species.

Pellaea *Link*

P. falcata (*R. Br.*) *Fée.* Recorded, No. 2084, Indigo Falls, Leneva (N.E. Vic.), common fern in clefts of rocks, 26.9.1948.

Blechnum *L.*

B. nudum (*Labill.*) *Mett. ex Luerssen.* Recorded, No. 2083, Indigo Falls, Leneva (N.E. Vic.), common water fern growing in clumps, 26.9.1948.

Asplenium *L.*

A. flabellifolium *Cav.* 3972, Paddy's River Falls, Tumbarumba, clefts of rocks, fr. 9.11.1949; 4679, 5 miles N. of Walla Walla, clefts in rocky outcrops, fr. 29.6.1950; 4657, Budgi Trig. Station Hill, Table Top, clefts of granite rocks, fr. 20.5.1950.

Widespread and, though more or less confined to sheltered sites on rock outcrops,

Pleurosorus *Fée*

P. rutifolius (*R. Br.*) *Fée.* 4801, Wymah Gap, Wymah, cleft of rocks, 27.8.1950; 4767, Howlong, clefts of rocks on hillside, fr. 17.8.1950; 4677, Walla Walla, common amongst granite rocks, fr. 29.6.1950; 3427, 9-Mile Hill Reserve, Wagga Road, Albury, quite common there.

clefts of granite rocks, 8.8.1949; 5029, Walbundrie, under granite rocks near township, fr. 4.10.1950. Recorded, No. 2069, Indigo Falls, Leneva, (N.E. Vic.), adherent to dry rocks, 26.9.1948. Fr. for most of the year.

Widespread at lower elevations, confined to drier sites amongst rocks.

Polystichum *Roth*

P. proliferum (*R. Br.*) *Presl.* 4008, Laurel Hill, clump in forest, 8.11.1949; 3946, The Glen, Tumbarumba, cultivated, 10.11.1949.

SALVINIALES

AZOLLACEAE

Azolla *Lam.*

Plentiful on lagoons and anabranches of the Murray River, extending inland to the tablelands, often forming dense masses over acres of water surface. Present for most months of the year.

Azolla filiculoides *Lam.* var. **rubra** (*R. Br.*) *Strasburger.* 2808-9, Old Sydney Rd., Albury, swamp near Albury Saleyards, red floating forms, 21.12.1948; 1260, Tooma, Tumbarumba district, 5.12.1947.

A. pinnata *R. Br.* 1373, Horseshoe Lagoon, Albury, 4.2.1948; 1378, 1701, 1834, Howlong Rd., Albury, 4.2.1948, 14.4.1948, 17.4.1948; 1363, Towong Bridge, Murray River, red, floating, abundant, 21.1.1948.

GYMNOSPERMAE.

GINKGOACEAE

Ginkgo *L.*

† **G. biloba** *L.* "Maidenhair Tree". Successfully cultivated at Tooma, 12.1947. Uncommon.

ARAUCARIACEAE

Araucaria *Juss.*

§ **A. bidwillii** *Hook.* "Bunya Bunya Pine". Albury Botanic Gardens. Commonly cultivated.

§ **A. cunninghamii** *D. Don.* "Hoop Pine". Albury Botanic Gardens, cultivated.

PINACEAE

Pinus *L.* "True Pines"

† **P. radiata** *D. Don.* "Insignis Pine", "Monterey Pine". Commonly cultivated, with extensive plantations at Carabost, Rosewood and Mannus. In the latter area planted to control St. John's Wort (*Hypericum perforatum*).

† **P. halepensis** *Mill.* "Aleppo Pine". A seedling cultivated in Albury Botanic Gardens from the Lone Pine of Gallipoli may possibly be *P. halepensis* var. *brutia* (Ten.) Henry.

Cedrus *Trew.* "True Cedars"

† **C. libani** *A. Rich.* "Cedar of Lebanon". 1042, Welaregang, cultivated, 27.12.1946.

† **C. deodara** (*Roxb.*) *G. Don.* "Deodar". Commonly cultivated. Albury Botanic Gardens, Table Top, Upper Wantagong.

Abies *Mill.* "Firs"

† **A. numidica** *Lannoy.* "Algerian Fir". 1052, Welaregang, cultivated, 27.12.1946.

† **A. nordmanniana** (*Steven*) *Spach.* "Nordmann Fir". 1053, Welaregang, cultivated, 27.12.1946.

Pseudotsuga *Carrière*

† **P. taxifolia** (*Poir.*) *Britton ex Sudw.* "Oregon". 5533, Mullengandra, cultivated, 13.9.1951.

TAXODIACEAE

Cryptomeria *D. Don*

† **C. japonica** (*L.f.*) *D. Don.* Occasionally cultivated, but unsuccessful at Upper Wantagong (Miss Jocelyn Henderson, p.c.).

Sequoia *Endl.*

† **S. sempervirens** (*Lamb.*) *Endl.* "Californian Redwood". Cultivated in parts of the Upper Murray district; Khancoban; 1041, Welaregang, 27.12.1946; also at Upper Wantagong.

Taxodium *L. C. Rich.*

† **T. distichum** (*L.*) *L. C. Rich.* "Bald Cypress". 4429, Albury Botanic Gardens, cultivated, 22.1.1950.

CUPRESSACEAE

Callitris *Vent.* "Cypress Pines"

C. glauca *R. Br. ex Mirb.* "White Cypress Pine". 4488, Dudal Comer Swamp, Henty, common, 14.2.1950; 4567, Yerong Creek Road, Henty, plentiful, 3.3.1950; 4568, 4572, Walbundrie township, 6.3.1950.

More or less confined to areas west of the Great Southern Railway (Yerong Creek to Albury). Common in the Urangeline, West Henty and Brocklesby districts, absent or extremely rare in the Holbrook and Tumbarumba districts.

C. calcarata *R. Br. ex Mirb.* "Black Cypress Pine". Recorded on a hill near Wagra (Wymah?), Upper Murray by Maiden Forestry Handbook, Pt. II (1917), 168. According to Mr. B. U. Byles, District Forester, Wagga Wagga (p.c.) it occurs on dry hilltops within the area.

Cupressus *L.* "True Cypresses"

† **C. sempervirens** *L.* "Ltalian Cypress". 580, Woomargama Cemetery, 12.1.1947. Commonly cultivated.

† **C. funebris** *Endl.* "Funeral Cypress". 1440, Albury, cultivated, 7.2.1948.

† **C. glabra** *Sudw.* "Arizona Cypress". 1759, cultivated Culcairn, 8.6.1948; 3400, Monument Hill, Albury, 23.7.1949; cultivated Adelong township.

† **C. torulosa** *D. Don.* "Weeping Cypress". Cultivated 1047, Welaregang, 27.12.1946; 3418, Table Top, avenue, 8.8.1949.

† **C. macrocarpa** *Hartw.* "Monterey Cypress". Recorded Upper Wantagong (as *C. lambertiana* Gord.).

† **Heyderia** *K. Koch.*

† **H. decurrens** (*Torr.*) *K. Koch.* 5338, Munderoo, near Tumbarumba, ornamental tree in churchyard, 12.11.1950; 3399, Albury Botanic Gardens, cultivated, 23.7.1949. Occasionally cultivated.

ANGIOSPERMAE

MONOCOTYLEDONAE

TYPHACEAE

Typha *L.*

T. muelleri *Rohrbach.* " Cumbungi ", " Bulrush ". 342, Woomargama, in garden pond, 16.1.1947.

T. angustifolia *L.* var. **brownii** (*Kunth*) *Kronf.* " Cumbungi ", " Bulrush ". 343, Garry Owen Reserve, Holbrook, 18.1.1947; 2956, Cumberoona Reserve, Bowna, 9.1.1949.

Collectively, both species are abundant along creeks, in swamps and lagoons.

SPARGANIACEAE

Sparganium *L.*

S. antipodum *Graebn.* " Burr Reed ". Recorded for Murray River, near Towong and Omeo (Vic.) by Williamson (1928, p. 247).

POTAMOGETONACEAE

Potamogeton *L.*

P. natans *L.*, sens. lat. " Floating Pondweed ". 1299, Munderoo Creek, Mannus, 27.12.1947; 1313, Walwa (Vic.), in lagoons, 27.12.1947; 2611, Walla Walla, in stock tanks in paddock, 17.11.1948; 136, Culcairn Rd., Ralvona, in roadside lagoon, 21.12.1946; 1842, Doctor's Point, Albury, non-flowering, plentiful in shallow lagoons, 15.8.1948. Fl. Nov.-Jan.

Widespread and common in lagoons and still-water ponds. This group forms a large proportion of the plant debris on banks of the Murray River following the seasonal fall in May and June, together with *Triglochin* spp.

P. ochreatus *Raoul.* 1666, Murray River, Albury, wholly submerged, 1.4.1948; 3329, 14-Mile Reserve, Howlong Rd., Albury, submerged in freshwater stream, 6.6.1949. Not observed elsewhere.

NAJADACEAE

Najas *L.*

N. tenuifolia *R. Br.* 4269, 4398, 4686, Stock Reserve tank, Walla Walla, light green, semi-submerged; abundant with members of the Characeae, 30.11.1949, 24.11.1950, 7.7.1950. Fl. and fr. irregular. Observed only at this locality.

JUNCAGINACEAE

Triglochin *L.*

T. calcitrapa *Hook.* 4871, 2 miles S.E. of Balldale, in sandy soil of *Callitris glauca* forest reserve; amongst moss, *Crassula* spp. and other herbage, 24.9.1950.

T. centrocarpa *Hook.* 5906, 3 miles S. of Gerogery, in shallow depressions of railway ditch, 24.10.1952.

T. procera *R. Br.* 149, Culcairn Road, Holbrook, 21.12.1946; 1140, Holbrook, 28.9.1947; 1669, 14-Mile Reserve, Howlong Road, Albury, 9.4.1948; 5398, Gerogery Road, Jindera, common in roadside swamps, 28.11.1950. Fl. summer.

Frequent in creeks, lagoons and swamps throughout the area.

T. turrifera *Ewart.* 5542, Wallandool Reserve, near Urangeline, light green, on margins of clay pans or shallow pools in open grassland; localised patches; similar in habit and habitat to *Myosurus minimus*, 18.9.1951.

ALISMATACEAE

Alisma *L.*

A. plantago-aquatica *L.* "Water Plantain". 1351, Woomargama, pond plant, 24.12.1947; 467, Murray River, Towong, plentiful in lagoons, full fl. 27.12.1946; 3178, Waterworks Reserve, Albury, sparingly distributed in fresh water streams, mostly fr. 21.3.1949. Observed flowering in roadside ditch, Munderoo, Tumbarumba, 12.1949. Fl. Nov.-Jan. Fairly plentiful along fresh water streams in the area, especially along the lagoons and anabranches of the Murray River.

Damasonium *Juss.*

D. minus (*R. Br.*) *Buchen.* 4603, Fagan's Reserve, 3 miles N. of Walbundrie, small forms in swamp, fr. 20.3.1950; 2782, 4707, Bulgandry Reserve, Bulgandry, common in swamp, 13.12.1948, fl. and fr. 14.7.1950; 5392, Cemetery Reserve, Henty, under tall herbage in marshy areas, fl. and fr. 24.11.1950; 1435, Burrumbuttock, in swamp, 25.2.1948. Fl. irregular.

Frequent in swamps but not plentiful; sometimes seen in gilgais of open grassland during wet seasons. Small forms less than six inches high can occur.

Sagittaria *L.*

* **S. sagittifolia** *L.* "Arrowhead". 652, Woomargama, spontaneous in ornamental lake, 6.2.1947. Uncommon.

HYDROCHARITACEAE

Elodea *Michx.*

* **E. canadensis** *Michx.* 1371, Howlong Rd., Albury, common submerged pond plant, 7.2.1948.

Of prolific growth in the lagoons and billabongs of the Murray River around Albury. When the river is low in late autumn and winter, it forms masses of debris similar to seaweed on the banks.

† **E. densa** *Casp.* 5782, Albury Botanic Gardens, proliferating in ornamental fish pond, fl. 6.12.1951.

Vallisneria *L.*

V. spiralis *L.* "Eel Weed". 649, Mannus, about 2,500′, plentiful in pools, 24.2.1947; 2608, Walla Walla, stock reserve tank, 17.11.1948; 1696, 14-Mile Reserve, Howlong Rd., Albury, common in shallow running water, 9.4.1948. Fl. Nov.-Feb. Widespread in ponds and permanent, slow-running streams.

Ottelia *Pers.*

O. ovalifolia (*R. Br.*) *L. C. Rich.* 1358, Culcairn Road, Holbrook, in shallow roadside pond, 10.1.1948; 4721, Waterworks Reserve, Albury, in lagoons, in bud, 30.7.1950 (abundant fl. at this site on 10.4.1950); 3196, between Albury and Wodonga, common in ponds, 27.3.1949. Recorded 1,300 Walwa (Vic.), common in lagoons, 27.12.1947. Fl. Dec.-April.

Widespread in ponds and lagoons at lower elevations.

GRAMINEAE

Zea *L.*

† **Z. mays** *L.* var. **japonica** *Koern.* 3069, Culcairn Railway Station, red and green variegated horticultural variety, 15.2.1949.

Ordinary agricultural forms of maize (*Zea mays* L.) are occasionally cultivated as fodder crops in gardens or orchards. The report of the first Exhibition of the Albury Agricultural and Horticultural Society of 1857 records that "the maize grown in the township (of Albury) by Mr. Conley was very fine". The Agricultural Report for the police district of Albury (*Border Post,* 30.4.1862) stated that 94 acres of maize were cultivated for grain and 6 acres for fodder in comparison with wheat grain 4,556, hay 180; barley, grain 53, fodder 16½, hay 44; oats, grain 942, hay, 1,106; rye, 2 acres. Luke Gulson states in the same paper (12.3.1886) that at Tooma maize produces 80 to 100 bushels to the acre. It is evident from this data that maize was more extensively cultivated in the past than at present.

Imperata *Cyr.*

I. cylindrica (*L.*) *Beauv.* var. **major** (*Nees*) *C. E. Hubbard.* "Blady Grass". 1828, on railway embankment, five miles south of Gerogery, large patch, fl. 29.6.1948. Despite the wide distribution of this species, it has not been observed elsewhere in the area. Possibly introduced into the area.

Eulalia *Kunth*

E. fulva (*R. Br.*) *Kuntze.* "Silky Browntop". 1700, 4645, 14-Mile Reserve, Howlong Rd., Albury, on hard dry soil, not common, 9.4.1948, 7.5.1950. Apparently uncommon, unless inconspicuous amongst the ubiquitous *Bothriochloa ambigua.* At least distributed along the Murray River flats from Albury to Howlong.

Bothriochloa *Kuntze* "Red Leg Grasses"

B. ambigua *S. T. Blake.* "Red Leg Grass". 809, The Glen, Tumbarumba, 5.4.1947; 3072, Culcairn, common in railway enclosure, 15.2.1949; 505, 506, 995, 828, 793, 693, Holbrook district, 1.3.1947 (505-6), 7.1.1947, 2.4.1947, 4.4.1947, 7.3.1947; 2736, Monument Hill, Albury, early fl. 5.12.1948; 3006, Murray River, Albury, on sandy banks, 22.1.1949; 882, Woomargama, 16.1.1947. Many additional localities within the area are given by Blake (1944, p. 30). Fl. Dec.-March.

Abundant over the area. Generally considered to be of low nutritive value, but as shown by Moodie (1934), is capable of enrichment by addition of superphosphate to the pastures in the Albury district. Increased pasture improvement will cause it to disappear as soil fertility rises, only to reappear on cessation of top-dressing and consequent fall in fertility. A dominant summer grass, it is often required to fulfil the difficult role of bridging the prolific spring growth and early summer drying off, with the onset of winter growth from March onwards, in a winter rainfall area.

B. decipiens (*Hack.*) *C. E. Hubbard.* Recorded by Blake (1944, p. 33), for Walla Walla, Elliott, 2.1907.

Hemarthria *R. Br.*

H. uncinata *R. Br.* "Mat Grass". 3258, The Glen, Tumbarumba, plentiful along sheltered creek banks, 25.4.1949; 5445, Paddy's River, Tooma, abundant in swampy river flats, 26.12.1950; 856, 10-Mile Creek, Holbrook, 14.12.1946; 1424, Wodonga (Vic.) on moist sandy lagoon bank, 21.2.1948. Fl. Nov.-Feb., later in more sheltered areas, especially at higher elevations. Widespread in marshy areas and along shady creek banks.

Sorghum *Moench.*

† **S. sudanese** (*Piper*) *Stapf.* "Sudan Grass". 865, Ournie, cultivation paddock, 27.1.1947. Recorded by Hurst (1942) as poisoning cattle in the Albury district. Cultivated as a fodder crop in diverse localities.

† **S. verticilliflorum** (*Steud.*) *Stapf.* "Rhodesian Sudan Grass". 720, Welaregang, in cultivation paddock, 17.3.1947. Not observed elsewhere.

* **S. halepense** (*L.*) *Pers.* "Johnson Grass". 3083, on railway enbankment 2 miles south of Henty, 18.2.1949; 1100, Holbrook, garden weed, 5.1947. Recorded by Hurst (1942) as poisoning stock in the Albury District. A troublesome weed in Albury gardens and freely naturalised in the Cemetery.

The Tintaldra correspondent to the Border Post of 1.3.1889 mentions "Mr. Sutherland of Thologolong who secured 12 lb. of seed of what is called 'Johnson's grass', an American plant, last September (1888) sowed one acre of it. To-day it is nine feet high and grows like sorghum but is more prolific. The acre is being kept for seed but some of it was cut for horses who relished it. A much larger area will be sown the coming season." The writer inferred that the seed was obtained from Dookie in Victoria.

† **S. vulgare** *Pers.* var "Saccaline". This is cultivated on a small scale in the Albury District for cattle fodder. In the wheat belt it proves to be troublesome for subsequent wheat crops.

Dichanthium *Willemet*

D. sericeum (*R. Br.*) *A. Camus.* "Queensland Blue Grass". 3160, one half mile north of Table Top Railway Station, in isolated clumps, 19.3.1949; 3312, railway embankment north of Culcairn, near 368-mile peg, large but defined patch, 27.5.1949.

Sparingly distributed along the Great Southern Railway Line (Yerong Creek to Albury) and not observed elsewhere. B. P. Bell of Thurgoona stated that patches of this grass have been present on the railway line at Ettamogah (5 miles N. of Albury) for many years, and that small patches occur in pastures in very wet years, but it is now almost extinct.

Themeda *Forsk.*

T. australis (*R. Br.*) *Stapf.* "Kangaroo Grass". 884, Tumbarumba, common pasture grass, 23.12.1946; 2687, Monument Hill, Albury, 28.11.1948; 4822, Nail Can Hill, Albury, in scrub land, 11.9.1950. Common and widespread, most plentiful in railway enclosures, cemeteries, parks and unimproved, little-grazed pastures. Probably a dominant native species prior to settlement, now rapidly receding due to cultivation and grazing. Unjustly despised because of its coarse growth, it has a useful place in animal husbandry by providing much needed roughage to offset the effects of luscious, highly improved grasslands.

Tragus *Haller*

T. australianus *S. T. Blake.* "Small Burr Grass". 698, Holbrook Bridge, single plant on footpath, 10.3.1947. Rare.

Digitaria *Heist. ex Fabric.*

D. divaricatissima (*R. Br.*) *Hughes.* "Umbrella Grass". 3153, Table Top, in railway enclosure, forming dense clumps and fairly plentiful after "burning off", 19.3.1949; 4627, railway line, Albury, 30.4.1950. Uncommon, probably rare.

D. ammophila (*F. Muell.*) *Hughes.* "Hairy Umbrella Grass". 3084, 2 miles south of Henty in railway enclosure, over several square yards, regrowth after "burning off", 18.2.1949; 4566, railway line, 4 miles N. of Henty, in clumps, 6.3.1950. Uncommon, probably rare.

* **D. sanguinalis** (*L*). *Scop.* "Summer Grass". 3164, 3323, Albury, common garden weed, 20.3.1949, 5.6.1949. Probably widespread.

* **D. adscendens** (*H., B. et K.*) *Henrard.* "Summer Grass". 544, 946, The Glen, Tumbarumba, 24.2.1947, 26.1.1947; 741, Holbrook Park, 23.3.1947. Fl. Dec.-March. Widespread in gardens and cultivated lands.

* **D. ischaemum** (*Schreb.*) *Muhl.* 526, The Glen, Tumbarumba, lawn grass, 24.2.1947; 707, Jingellic-Tumbarumba Road, near The Glen, margin of permanent swamp, about 2,500′, 11.3.1947. Not observed outside the Tumbarumba District. Dawson, "Practical Lawncraft", Ed. (1949), 275, remarks that this grass is the commonest turf weed in Shanghai, where it is known as Crab Grass. It invades turf rapidly and causes a great deal of labour to effect its removal, in a climate described as, "suffering from extreme heat and cold with regular rainfall". It is probable that this species will spread under these conditions.

D. brownii (*Roem. et Schult.*) *Hughes.* "Cotton Panic". 857, Triangle Reserve, Holbrook, a rarer pasture species, 16.12.1946; 3137, Monument Hill, Albury, on roadside, fairly common, 27.2.1949; 3021, Affleck Street, Albury, on hard ground of footpath after recent "burn off", 24.1.1949. Fl. Dec.-Feb.

Presumably widespread but not common. Localities cited are dry and of low fertility and invariably exhibit an associated growth of *Eragrostis elongata.*

Eriochloa *H. B. et K.*

E. pseudoacrotricha (Stapf. ex Thell.) C. E. Hubbard. ex S. T. Blake. Recorded No. 5790, Mahonga, 8 miles N.W. of Rand on roadsides, 10.12.1951.

Paspalum *L.*

* **P. dilatatum** *Poir.* "Paspalum". 846, Wantagong, 6.1.1947; 899, Woomargama, 12.12.1946; 1017, Holbrook, 13.5.1947; 3306, Table Top, 15.5.1949. Fl. Dec.-March.

Observed at Tumbarumba, 2,000′ to 2,500′, where it makes poor growth, but prolific in areas under 1,000′, showing a predilection for roadsides and marshy sites, localities with a higher degree of summer moisture and not constantly grazed. Rarely seen in sheep pastures, common in grazing areas along the Upper Murray.

P. distichum *L.* "Water Couch". 898, Woomargama, 12.12.1946; 1016, Holbrook, 13.5.1947. Widespread and abundant during summer in swamps, creek gullies and roadside drainage channels. Fl. Dec.-April.

* **P. urvillei** *Steud.* 4634, ½ mile S. of Albury Railway Station, single plant on line, fl. 30.4.1950. Observed only at this locality.

Axonopus *Beauv.*

* **A. affinis** *A. Chase.* "Narrow-leaved Carpet Grass". 527, The Glen, Tumbarumba, cultivated successfully as lawn grass, 26.1.1947. Uncommon.

Paspalidium *Stapf*

P. jubiflorum (*Trin.*) *Hughes.* "Warrego Grass". 3236, on railway line south of Henty, small dense stand, 11.4.1949; 5793, Mahonga, 8 miles N.W. of Rand, along shaded creek banks, 10.12.1951. Not collected elsewhere.

P. aversum *J. Vickery.* 3096, Culcairn, in railway enclosure, 18.2.1949; 3147, Culcairn township, 18.3.1949; 791, Holbrook Pound Yard, common grass, 4.4.1947; 829, Holbrook, in shady paddock, 2.4.1947; 978, Ralvona Railway Siding, 21.12.1946; 974, Woomargama Cemetery, 12.1.1947; 3155, Table Top, railway enclosure, plentiful, 19.3.1949. Fl. Dec.-April.

Widespread and common in areas of lower elevations; plentiful on railway embankments.

Breakwell (1917) records the panics of the Holbrook district as including "*Panicum gracile*". This may refer to *Paspalidium gracile* (R. Br.) Hughes, which certainly occurs to the west of the area and possibly within it, or may refer to the species now recognised as *P. aversum.*

Panicum *L.*

P. obseptum *Trin.* "Swamp Panic". 1420, Bandiana (Vic.) mixed with sedge flora, 21.2.1948; 3175, Kiewa River flats, Bandiana (Vic.), 6 miles east of Wodonga, plentiful in short turf of moist river flats, in company with *Paspalum distichum,* the flag of which it closely resembles, 20.3.1949. Most probably present along the swampy flats of the Murray River.

P. effusum *R. Br.* 3088, Cemetery Reserve, Henty, on arid slate, 18.2.1949; 3089, Henty Common, abundant in grassland, 18.2.1949; 1824, Henty Road, Culcairn, common tussocky grass on roadsides, 2.3.1948; 3150, Culcairn, weed in street flower beds, 18.3.1949; 696, 731, 907, Holbrook and environs, 7.3.1947, 15.3.1947, 18.12.1946; 854, Little Billabong, 16.12.1946; 3108, Jindera, common in pastures, 22.2.1949; 3158, Table Top, plentiful, 19.3.1949; 2709, Monument Hill, Albury, 5.12.1948; 3227, railway embankment, Gerogery, 8.4.1949. Fl. Dec.-April, but largely dependent on seasonal conditions.

Widespread and common in pastures during summer. The dead seed-heads together with those of *Chloris truncata* are blown against fences and into watercourses during late summer and early winter. Previous decades record a heavy influence of "yellows" or photo-sensitisation effects in sheep due primarily to this grass, but the incidence of this disease appears to be decreasing, indicating a decrease of *P. effusum* in grazing lands.

P. buncei *F. Muell.* Recorded for Brocklesby on 8.1.1941 during investigations into Yellow Bighead in sheep (Albury P.P. Board Office Records).

***P. laevifolium** *Hack.* 816, Carboona Gap, Tumbarumba, roadside grass at margin of swamp, about 2,000′, 4.4.1947; 3233, Pleasant Hills Road, Henty, fairly plentiful in moist yellow clay of roadside, 11.4.1949; 529, Holbrook, spreading in drain from cattle stables, 21.2.1947; 3270, Albury Street, Holbrook, common on footpath, mature to over-mature, 17.4.1949; 3142, 3161, Albury, weed in garden, 20.3.1949; 3135, Albury, common in lawns and drains of hospital grounds, 13.3.1949; 3167, Monument Hill, Albury, in moist situation in disused stone quarry, 20.3.1949; 3184, Mungabarina Reserve, Albury, fairly common in moist ground, 21.3.1949; 1482, Talmalmo, on rubbish tip, 28.3.1948. Recorded 3173, Kiewa River flats, Bandiana (Vic.) scattered amongst herbage, 20.3.1949. Fl. Feb.-April.

Commenced to flower in Albury gardens on 24.2.1950. Present as a weed in Albury Botanic Gardens. Widespread and very common at the localities cited. Its occurrence within the area is in agreement with the observations of Bews (1918), "An autumn grass . . . very common in cultivated land. A ruderal species".

***P. coloratum** *L.* 4604, 6078, 3 miles N. of Walbundrie, roadsides, 20.3.1950, 4.2.1953.

P. decompositum *R. Br.* "Native Millet". 3082, 2 miles south of Henty in railway enclosure, fairly common after "burning off", 18.2.1949; 4565, railway line 4 miles N. of Henty, dense clumps in moist situations, 6.3.1950; 3054, Balldale Road, Rand, in roadside watertables, 7.2.1949; 732, Culcairn Road, Holbrook, roadside grass, 15.3.1947; 1421, Bandiana (Vic.) on river flats, 21.2.1948. Fl. summer and autumn, but largely dependent on seasonal conditions, making rapid regeneration after summer rains. Widely spread but not common. A pure stand of this grass was responsible for an outbreak of "yellows", i.e., photo-sensitisation in sheep during late summer 1943.

* **P. capillare** *L.* "Witchgrass". 500, The Glen, Tumbarumba, weed in garden, about 2.500′, 24.2.1947; 3015, East Henty, weed in garden, but "growing in paddock during wet seasons", 25.1.1949; 3092, Henty Cemetery, not common, 18.2.1949. Fl. Jan.-March. Flowering material observed in Albury Botanic Gardens on 14.3.1949; mature to dead seed-heads on material observed in Jindera garden, 10.6.1949, where it was considered to be a pest. Widespread, but not common, mostly as a garden weed.

P. prolutum *F. Muell.* 2541, Henty, in moist depressions on railway line near trucking yards, plentiful, 11.11.1948; 3017, Henty Road, 2 miles north of Culcairn, fairly common on roadside only, 25.1.1949; 1160, Howlong, on moist drain bank, 16.10.1947; 1362, Corowa Road, Howlong, in drain, 13.1.1948; 4212, Brocklesby, railway enclosure, patches in moist clay margins of drains, 1.12.1949; 4454, Lockhart Road, Rand, regrowth after recent rains, 9.2.1950; 1234, Burrumbuttock, on moist creek bank, 6.11.1947; 1448, Bethanga Bridge, Albury, on moist hard clay, 1.3.1948; 2518, Albury, in damp depressions of railway enclosure, 7.11.1948. Fl. Oct.-March, exhibiting successive regenerations after summer rains.

Apparently confined to areas under 1,000′ elevation, not subject to grazing and preferring moist localities. Occurs as dense clumps of sporadic distribution. Not recorded by Ewart (1930) for the corresponding N.E. Victoria.

* **P. miliaceum** *L.* 3199, footpath opposite cemetery, Albury, single plant only, 2.4.1949. Uncommon.

Isachne *R. Br.*

I. australis *R. Br.* "Swamp Millet". 855, 3274, Lankey's Creek, fairly common on moist creek banks, 23.12.1946, 25.4.1949; 3110, Mungabarina Reserve, Albury, single clump on water's edge, 23.2.1949; 5518, Bungowannah, Murray River flats, small clump on moist sandy soil, mostly fr. 1.5.1951. Observed at Mannus (7 miles S.W. of Tumbarumba), about 2,300′ as common in creeks. Uncommon; rare in numerous swamps and lagoons of the Murray River.

Echinochloa *Beauv.*

* **E. crusgalli** (*L.*) *Beauv.* "Barnyard Grass". 525, Tumbarumba, garden weed, 24.2.1947; 903, Carboona Gap, Tumbarumba, weedy grass in roadside drain, 16.12.1946; 3093, Culcairn, on railway embankment, 18.2.1949; 4558, Hovell Reserve, Burrumbuttock, dam banks, 2.3.1950; 3174, Kiewa River, Bandiana (Vic.), common on swampy river flats, 20.3.1949. Fl. spring and autumn.

Plentiful throughout the area in moist spots, mostly ruderal in homestead gardens, swampy flats and sheltered positions around stockyards.

* Var. **frumentacea** (*Roxb.*) *Wight.* "Japanese Millet". Occasionally cultivated in Tumbarumba and Albury districts. Has been suspected of producing photo-sensitisation in sheep.

Setaria *Beauv.*

* **S. glauca** (*L.*) *Beauv.* "Pale Pigeon Grass". 1417, 3214, Howlong Common, abundant, 23.2.1948, 1.4.1949; 2786, Stanley Street, Albury, 14.12.1948; 3029, Swift Street, Albury, 27.1.1949. Fl. Dec.-April. Not observed in other localities.

* **S. verticillata** (*L.*) *Beauv.* "Bristle Pigeon Grass". 3119, Rand, weedy grass in garden, 25.2.1949; 3138, Culcairn, ruderal and common, 8.3.1949; 943, Woomargama, garden, 16.1.1947; 2958, Table Top, plentiful in garden, 9.1.1949. Observed in many gardens in Albury. Fl. Jan.-March. Widespread in gardens.

* **S. geniculata** (*Lam.*) *Beauv.*, var. **pauciseta** *Desv.* "Slender Pigeon Grass". 945, The Glen, Tumbarumba, common in moist ground, 26.1.1947; 501, Holbrook, 16.2.1947; 510, 2-Mile Reserve, Holbrook, in swamp, 1.3.1947; 3001, Murray River, Albury, loose tufts on sandy banks, 22.1.1949; 3041, Botanic Gardens, Albury, weedy grass in flower beds, 26.1.1949; 2979, Wodonga Saleyards (Vic.) 15.1.1949. Fl. Jan.-July, but mostly in summer.

Almost everywhere in the area, very common and with no specific habitat.

† **S. palmifolia** (*Willd.*) *Stapf.* "Palm Grass". 3033, Albury Botanic Gardens, cultivated, 26.1.1949. Uncommon.

Stenotaphrum *Trin.*

† **S. secundatum** (*Walt.*) *Kuntze.* "Buffalo Grass". 2987, Albury lawn grass, 22.1.1949. Commonly and successfully cultivated as a lawn grass, but showing no tendency to become naturalised.

Pseudoraphis *Griffith ex Pilg.*

P. spinescens (*R. Br.*) *J. Vickery.* 880, Culcairn Road, Ralvona, creeping grass in swamps, 21.12.1946; 1382, Howlong Road, Albury, common swamp grass, 4.2.1948; 4357, Waterworks Reserve, Albury, common creeping grass in lagoons, mixed with *Amphibromus,* abundant fl. 13.1.1950. Fl. Dec.-Feb. Observed along the Billabong Creek, Holbrook. Common in swamps and lagoons along the Murray River, absent or rare in areas over 1,000′.

Pennisetum *L. C. Rich.*

P. compressum *R. Br.* "Swamp Foxtail". 1455, Gerogery, growing freely in drain near "Gerogery East" Estate, 3.3.1948; 3055, Goombargana-Balldale Road, Parish of Richmond, about 20 tussocks scattered over an acre of ground amid rocky outcrops on side of grassy hillside, presumably situated on soakage on account of the associated green growth of *Eragrostis brownii,* 7.2.1949. Rare.

* **P. villosum** *R. Br.* "Long-styled Feather Grass". 941, Albury Street, Holbrook, clump on footpath, 18.1.1947; 3249, Burrumbuttock on roadside gravel, 22.4.1949; 3010, corner of Paine and Pemberton Streets, Albury, large clump, 21.1.1949. Observed Henty Saleyards, fl. 5.1949; Albury Saleyards, fl. 6.1949 and 21.2.1950. Fl. Jan.-May.

Fairly common around townships, not observed in pastures. Common constituent of ornamental grass seed mixtures, resulting in escape from cultivation. Rarely eaten by stock, but in view of its presence near saleyards, is probably transported by them.

* **P. clandestinum** *Hochst. ex Chiov.* "Kikuyu Grass". Occasionally planted in lawns and on sportsgrounds. Successfully employed at Burrumbuttock to protect dam banks; also extensive patch along creek bank of stock reserve at Mullengandra; common in paddock at Gerogery. 4588, Mullengandra, along creek banks, 11.3.1950; 5513, Henty, cultivated as lawn grass, abundant fl. at same time every year, fl. 13.4.1951.

Checked by frosts, but recovers if protected from grazing and has sufficient moisture. Experimental planting (sub. *P. longistylum* Hochst.) recorded for Holbrook and Culcairn by Whittet (1921, p. 314).

† **P. ruppellii** *Steud.* 3034, Botanic Gardens, Albury, cultivated, 26.1.1949. Uncommon.

† **P. purpureum** *Schum.* "African Feather Grass". Favourable reports of cultivation at Tumbarumba are given by Breakwell (1921, p. 489). I have seen no specimens.

Ehrharta *Thunb.*

* **E. longiflora** *Sm.* "Veldt grass". 2754, Monument Hill, Albury, small clump under bush on roadside, on site of discarded wreaths, end of fl. 5.12.1948. Cultivated and spontaneous in the Albury Botanic Gardens. Not observed outside the environs of Albury.

* **E. erecta** *Lam.* "Panic Veldt Grass". 2656, 3036, 3631, Albury Botanic Gardens, troublesome weed in flower beds, of similar habit to *Digitaria adscendens,* 25.11.1948, 26.1.1949, 25.9.1949. Flowering material plentiful at same site on 23.7.1949 and 24.9.1949. Fl. irregular. Not observed outside the environs of Albury, although common in gardens and waste land within the city itself.

* **E. calycina** *Sm.* Perennial Veldt Grass. 5643, Gerogery Road, Table Top, tussocks along a quarter mile of drains; soil erosion control project, 28.10.1951. Uncommon.

Microlaena *R. Br.*

M. stipoides (*Labill.*) *R. Br.* "Meadow Rice Grass". 2893, Murray's Crossing, Tumbarumba, sparingly distributed along creek bank, 27.12.1948; 2838, The Glen, Tumbarumba, in open forest land, 26.12.1948; 893, "Sour Flat" Reserve, Little Billabong, 14.12.1946; 3376, Monument Hill, Albury, shady spots in garden, flowering material scarce, 18.6.1949. Fl. Dec.-April, rarely as late as June, and then only in sheltered moist places.

Widespread and common, preferring shaded, moist, little-grazed areas, but scarcely an important pasture grass.

Phalaris *L.*

* **P. minor** *Retz.* "Lesser Canary Grass". 886, Holbrook, on rubbish dump, 18.12.1946; 5113, Wallandool near Urangeline, around roadside pools, 18.10.1950; 4193, Ryan, near Henty, margin of swamp, uncommon, 3.12.1949; 4210, Brocklesby, railway enclosure, 1.12.1949; 2957, Table Top, garden weed, 9.1.1949; 2570, Corowa Road, Howlong, in drain, 17.11.1948; 2976, Wodonga Saleyards (Vic.), 15.1.1949. Observed in Albury Botanic Gardens, fl. 29.9.1949. Fl. Sept.-Dec.

Weedy grass of waste places, widely spread and frequent.

† **P. tuberosa** *L.* "Phalaris". 905, Woomargama, 20.12.1946; 2672, Henty, cultivated, 26.11.1948.

Extensively cultivated and a valuable pasture grass. Fine pastures are in evidence at Tumbarumba, Khancoban, Gerogery, Holbrook and Walbundrie districts.

† **P. arundinacea** *L.* "Reed Canary Grass". 2757, Wodonga (Vic.), garden plant, 10.12.1948. Observed in gardens at Holbrook, Walbundrie, fl. 9.12.1948, and Albury Botanic Gardens. Ornamental grass.

* **P. paradoxa** *L.* 5795, Mahonga, 8 miles N.W. of Rand, in roadside ditch, 10.12.1951.

Anthoxanthum *L.*

* **A. odoratum** *L.* " Sweet Vernal Grass ". 887, Munderoo, Tumbarumba, common sweet-scented grass in marshy pastures, 23.12.1946; 1215, Carboona Gap, Tumbarumba, 18.10.1947. Occurs at Woomargama.

Abundant in swampy situations, and damper pastures in the Tumbarumba district, and rare or absent in areas below 1,000′.

Aristida *L.*

A. jerichoensis *Domin ex Henrard* var. **subspinulifera** *Henrard.* 802, Woomargama, 10.4.1947, of doubtful diagnosis because of immature specimen. 4577, Walbundrie, in grassland, 6.3.1950. Detailed distribution in area unknown.

A. personata *Henrard.* 3130, Pleasant Hills Road, one mile north of Henty, not common in sandy soil, 1.3.1949.

Occurs along the sandy shore of the Dudal Comer Swamp, near Henty, and probably quite common here when the swamp was filled with water and prior to settlement. Apparently localised in the western portion of the area.

A. behriana *F. Muell.* " Brush Wire Grass ". 2673, Fyfe's Reserve, Henty, in hard bare ground, 26.11.1948; 955, 1006, Holbrook, 13.12.1946, 29.4.1947; 3332, Table Top road, Jindera, not plentiful on roadside, 10.6.1949; 2622, Monument Hill, Albury, earliest fl. 21.11.1948. Fl. Nov.-March, occasionally later.

Widespread, frequent in most pastures, but not plentiful except in railway enclosures, etc.

A. ramosa *R. Br.* " No. 9 " or " Three-awned Spear Grass ". 686, 6-Mile Reserve, Holbrook, 3.3.1947; 988, 8-Mile, Jingellic Road, Holbrook, aggregations on ridges, 24.12.1946; 989, Holbrook, pastures, 16.12.1946; 987, Little Billabong, 16.12.1946; 1582, Hume Highway, Holbrook, tussocky, in large clumps, end of fl. 14.4.1948; 687, Woomargama, roadsides, 5.3.1947; 3245, Mullengandra, very common on hillsides, 22.4.1949; 3213, Brocklesby, 1.4.1949; 2727, 2758, 2760, Monument Hill, Albury, stiff, erect tussocks, plentiful on mica-schist, mixed with heath flora, 5.12.1948; 2802, 3162, Albury, garden, 19.12.1948, 20.3.1949. Fl. late summer to autumn, but inconstant. The mature seed-heads persist during the winter.

Common grass throughout the area, especially in areas below 1,500′, forming dense cover on hillsides, ridges and poorer soils to the exclusion of other species. Indicative of a particular type of poorer pasture. Relatively unpalatable to stock, which eat it in the young stage. The awned fruits are troublesome to stock.

A. longicollis *Henrard.* 6081, Walla Walla-Walbundrie Road, occasional plants on roadsides, 4.2.1953.

Stipa *L.* " Spear Grasses "

§ **S. ramosissima** *Trin.* " Coast Bamboo Spear Grass ". 5517, Albury, cultivated in garden, fl. 12.4.1951.

S. verticillata *Nees.* 6082, railway gates, Thurgoona, near Albury, 2.2.1953.

S. blackii *C. E. Hubbard.* 923, Little Billabong, in swamp at junction of Tumbarumba and Wagga Roads, foot of " Gentle Annie ", 18.12.1946; 4659, 4 miles N.W. of Pleasant Hills, abundant on swampy roadsides, mostly overmature, little fl. 14.6.1950; 4744, Culcairn-Henty Road, occasional tussocks, 4.8.1950; 4700, Alma Park, near Culcairn, abundant but little fl., mostly mature, 14.7.1950; 4661, Tonk's Reserve, 8 miles N. of Burrumbuttock, little fl. 26.6.1950; 4585, Burrumbuttock, tall, tussocky grass on roadsides, small regrowth after recent rains, fl. 13.3.1950. Observed fl. at Thurgoona on 12.9.1950. Fl. irregular, mainly Aug.-March, otherwise to a small degree for most of the year with favourable conditions.

Similar in habitat and distribution to *S. bigeniculata*, and both occur together along miles of roadsides and in lanes in the wheat areas.

S. scabra *Lindl.* 528, 957, Holbrook, 21.2.1947, 14.12.1946; 692, 6-Mile, Billabong Road, Holbrook, 7.3.1947; 738, Ten Mile Creek, Holbrook, on moist sand, 23.3.1947; 4651, Cemetery Reserve, Henty, occasional tussocks in fl. 9.6.1950; 4733, Hovell Reserve, 4 miles W. of Burrumbuttock, fl. in sheltered spots, 3.8.1950; 4791, Balldale, tussocks on roadside, 25.8.1950. Fl. Dec.-March, otherwise inconstant.

At least widespread in the western half of the area but may be masked from the collector by the concurrent growth of the widespread *S. variabilis.*

S. setacea *R. Br.* 2602, Howlong, in hard, bare ground of pasture paddock, in patches, 19.11.1948. Not observed elsewhere.

S. bigeniculata *Hughes.* 918, Wantagong, pasture grass of moist places, 3.1.1947; 922, Woomargama, common on roadsides, up to 3′ high, 20.12.1946; 1235, 1238, Burrumbuttock, fairly common in pasture, 6.11.1947; 2462, 80-Acres Reserve, Gerogery, common in moist spots, 1.11.1948; 2660, Gerogery, roadsides, 24.11.1948; 1163, 1186, 14-Mile, Howlong Road, Albury, tall grass in roadside drain, 16.10.1947, 21.10.1947. Fl. late Oct.-Jan., but largely dependent on seasonal conditions.

A common species in areas under 1,500′ and very plentiful in the wheat belt, e.g., the Burrumbuttock-Howlong and Rand-Walbundrie roads, also in little-used lanes in these districts, forming tall dense stands, rarely seen in heavily grazed stock routes. Prefers moist localities and is relatively unpalatable, since travelling stock avoid it when other feed is available.

S. variabilis *Hughes.* 959, 960, Holbrook, common pasture grass, 7.12.1946; 1206, 10-Mile Creek, Holbrook, tussocks on sandy bank, 2.11.1947; 3193, Walbundrie, moist sheltered position in stone quarry, flowering material scarce, 29.3.1949; 2738 Burrumbuttock, plentiful on grassy ridge, 3.12.1948; 2652, Jindera, on roadsides, 24.11.1948; 2633, Monument Hill, Albury, 21.11.1948. Fl. Sept.-Jan., less commonly to March, otherwise to a small degree for most of the year, depending on seasonal conditions.

The commonest species of *Stipa* in the area and not confined to particular soil types. Reaches maximum development and dominant in better soils with *Danthonia* spp. in areas under 1,500′. Of value in young growth, but awned fruits are troublesome to stock in early summer.

S. densiflora *Hughes.* 921, 1246, Tunnel Road, Woomargama, common on roadside, mixed with xerophytic flora on sedimentary formations, 20.12.1946, 26.11.1947; 5020, Walbundrie, township, on granitic outcrops, early fl. 4.10.1950; 2551, Budgi Trig. Station Hill, Table Top, on granite, about 1,000′, common, 10.11.1948. Fl. Nov.-Jan.

Observed on Jindera Gap (1,000′), and at Mount Stanley (N.E. Vic.), (3,000′). Confined to poor soils and ridges, mostly granite formations; absent from grasslands. A tall, coarse grass of little fodder value.

Oryzopsis *Michx.*

* **O. miliacea** (*L.*) *Aschers. et Schweinf.* "Rice Millet". 1393, 2800, Albury, ornamental grass in garden, free growth with natural generation, 1.2.1948, 19.12.1948; 2985, David Street, Albury, clumps on vacant allotment, 18.1.1949; 4583, Burrumbuttock, spreading in homestead garden, mature and immature fl. 13.3.1950. Fl. irregular. Occasionally cultivated, naturalised in Albury Municipality.

Echinopogon *Beauv.*

E. mckiei *C. E. Hubbard.* 1334, 2827, Murray's Crossing, Tumbarumba, fairly common on sandy bank of Tumbarumba Creek, about 2,200′, 2.1.1948, 27.12.1948.

E. intermedius *C. E. Hubbard.* 2855, Laurel Hill, in moist shady soakage from water race near sawmill, uncommon, 27.12.1948; 2886, The Glen, Tumbarumba, exposed situation in open forest, 2,300′-2,500′, 29.12.1948; 5442, Paddy's River near Tooma, occasional clumps in open forest, 26.12.1950; 5431, Munderoo West, Wolseley Park, occasional clumps on wooded hillside, 27.12.1950. Recorded 2726, Indigo Falls, Leneva (Vic.) on shady creek bank, 4.12.1948. Apparently widely spread, but not common at localities cited.

E. ovatus (*Forst. f.*) *Beauv.* 2846, Laurel Hill, common in shadey forest, about 3,000′-3,300′, 27.12.1948; 2882, The Glen, Tumbarumba, patches in open forest, 2,200′-2,500′, 28.12.1948; 1297, Carboona Gap, Tumbarumba, in shady situations, 26.12.1947; 962, Lankey's Creek, 2.1.1947; 858, "Sour Flat" Reserve, Little Billabong, 14.12.1946; 515, Billabong Creek, Holbrook, on shady bank, 30.1.1947. Fl. Dec.-Jan.

A sub-dominant species of shaded moist localities, fairly common along creek banks and in forests at localities cited. Not observed west of a meridional line through Holbrook.

Alopecurus *L.*

* **A. pratensis** *L.* "Meadow Foxtail". 864, Welaregang, tall grass, plentiful on bank of Murray River, 27.12.1946. Uncommon.

‡ **A. geniculatus** *L.* "Marsh Foxtail". 2064, Rand Road, Bulgandry, common in roadside mud, 20.9.1948; 3494, Oil Tree Lagoon, Balldale, fairly common in claypans, fl. 1.9.1949; 3703, Henty Common, along margins of stock tank, 3.10.1949; 3805, Bulgandry Reserve, Bulgandry, in swamps, 17.10.1949; 2641, Walbundrie Road, Culcairn, roadside claypans, 23.11.1948; 1092, Holbrook, swamp grass, 28.9.1947. Fl. Sept.-Nov.

Widespread in swamps and moist localities in areas of lower elevations. Its incidence at localities cited would scarcely justify its classification as a pasture species.

Sporobolus *R. Br.*

* **S. capensis** (*Willd.*) *Kunth.* "Parramatta Grass". 823, The Glen, Tumbarumba, rarer pasture grass, 7.4.1947; 796, 4-Mile, Jingellic Road, Holbrook, on roadside, 4.4.1947; 938, Holbrook, 16.12.1946. Fl. Dec.-April.

Widely spread but uncommon. Observed only at these localities.

S. elongatus *R. Br.* "Slender Parramatta Grass". 2964, 3122, Billabong Creek, Rand, uncommon in grey sandy loam of creek bank, 10.1.1949, 25.2.1949; 694, Hume Highway, Holbrook, 7.3.1947; 3032, Table Top, fairly common on roadside and in pastures, 27.1.1949. Fl. summer.

Observed on roadsides at Lavington, Table Top and Culcairn on 24.2.1950. Not common, but diffusely spread in sporadic clumps in areas under 1,000′. Prefers moist localities of higher fertility.

Polypogon *Desf.*

* **P. monspeliensis** (*L.*) *Desf.* "Beard Grass". 3132, 4750, Bake's Reserve, Gerogery, in moist clay of overflow from stock tank, 1.3.1949, 13.8.1950; 1167, 2-Mile Reserve, Holbrook, on margin of dam, 11.10.1947; 97, Lankey's Creek, in moist places, 26.1.1943; 928, Woomargama, common in swamps, 15.12.1946; 4538, Cumberoona Reserve, Bowna, in watercourses, 28.2.1950. Fl. Aug.-Feb., rarely to March in sheltered localities.

Widespread in swamps and marshy land with permanent moisture. Luxuriant growth occurs in marshy areas of the Upper Murray, e.g., Khancoban, Tooma and Welaregang.

Agrostis *L.* "Bent Grasses".

† **A. stolonifera** *L.* "Creeping Bent". 1012, Tumbarumba, lawn grass with free growth, 23.12.1946.

A. hiemalis (*Walt.*) *Britton, Sterns et Poppenb.* 504, 522, 2-Mile Reserve, Holbrook, swamp grass, uncommon, 1.3.1947, 10.2.1947; 1330, Blue Hill, Munderoo State Forest, Tumbarumba, shady position in damp open forest, 4.1.1948. Not observed outside these localities.

* **A. tenuis** *Sibth.* "Brown-top Bent". 1013, 1015, Tumbarumba, pastures, 22.12.1946, 23.12.1946; 1335, 1342, Murray's Crossing, Tumbarumba, plentiful in creek and on banks, 2.1.1948; 1014, Coppabella Creek, Jingellic, between rocks in creek bed, 27.1.1947; 2710, Albury, garden weed, 5.12.1948. Recorded 2907, Mt. Stanley, (N.E. Vic.) about 3,300′, very common, 3.1.1949. Fl. Dec.-Feb.

Widespread and common, reaching maximum development at elevations over 1,500′—well exemplified on either side of the Upper Murray Valley. Freely naturalised throughout the Tumbarumba district, and observed to be dominant in some grasslands at Rosewood (2,000′).

A. aemula *R. Br.* 2847, Laurel Hill, 8 miles N.E. of Tumbarumba, fairly common in forest land, 3,000′ to 3,300′, 27.12.1948. Not observed elsewhere.

A. avenacea *Gmel.* "Blown Grass". 2857, Laurel Hill, 3,000′-3,300′, 27.12.1948; 817, The Glen, Tumbarumba, common swamp grass, 4.4.1947; 3185, Bake's Reserve, Gerogery, 25.3.1949; 4753, Gerogery, occasional fl. plant along railway line, 13.8.1950; 795, 4-Mile, Jingellic Road, Holbrook, 4.4.1947; 972, Holbrook, 10.12.1946; 971, Woomargama, 12.12.1946; 1360, Corowa Road, Howlong, in drain, 13.1.1948. Fl. mainly Oct.-March, otherwise to a small degree during the year.

Widespread in swamps, marshy land and creek banks. Very common in swamps and lagoons along the Murray River. Constitutes a high proportion of herbage in grasslands during wet seasons and freely grazed by stock.

Deyeuxia *Clar. ex Beauv.*

D. brachyathera (*Stapf*) *J. Vickery.* 2813, 2817, Blue Hill, Munderoo State Forest, Tumbarumba, 2,500′-2,800′, in moist bed of ephemeral watercourse, headwaters of Jacky Thompson Creek, 26.12.1948. Not observed elsewhere in the area.

D. rodwayi *J. Vickery.* 1329, 2822, 2823, Blue Hill, Munderoo State Forest, Tumbarumba, 2,500′-2,800′, isolated plants forming a diffuse ground cover in forest, in company with *Poa caespitosa* Forst., 4.1.1948, 26.12.1948 (2822-3).

D. quadriseta (*Labill.*) *Benth.* 2812, Blue Hill, Munderoo State Forest, Tumbarumba, not plentiful in open forest, 26.12.1948; 2890, Murray's Crossing, Tumbarumba, fairly common on swampy flats, 27.12.1948; 883, Carabost in roadside drain, 23.2.1947; 975, The Glen, Tumbarumba, pasture grass in moist paddock and plentiful in swamps, 25.12.1946; 801, 979, Woomargama, in moist pastures and on roadsides, 10.4.1947, 13.12.1946. Recorded by Vickery (1940, p. 52) from Holbrook (Whittet, 1931). Fl. Dec.-Jan.

Widespread and variable grass, commonest at the higher elevations with a preference for moist localities.

Dichelachne *Endl.*

D. crinita (*L.f.*) *Hook. f.* "Long-hair Plume Grass". 1263, 10-Mile Creek, Holbrook, on moist sandy creek bank, 14.12.1947. Observed on Monument Hill, Albury. Uncommon.

D. sciurea (*R. Br.*) *Hook. f.*, and forms. 2856, 2869, 2871, Laurel Hill, 8 miles N.E. of Tumbarumba, 3,000′-3,300′, common in shady forest land and on roadsides, 27.12.1948; 803, The Glen, Tumbarumba, on creek banks, 5.4.1947; 1306, Carboona Gap, Tumbarumba, on gravel and sand, 26.12.1947; 919, Tunnel Road, Woomargama, swamp grass, 18.12.1946; 2502, 2753, Monument Hill, Albury, not common, 7.11.1948, 5.12.1948; 4326, Mason's Hill, Tumbarumba, forests, 28.12.1949. Recorded 2946, 2950, Mount Stanley (N.E. Vic.), common in forest land, 3.1.1949. Fl. Nov.-April.

Widespread and common grass, but variable according to habitat, whether on alluvial soils or on granite ridges. A useful pasture species. A hardy species, having been observed on shallow alluvium on rock.

D. rara (*R. Br.*) *J. Vickery.* 2859, 2873, Laurel Hill, 3,000′-3,300′, common slender grass in shady forests, 27.12.1948; 2811, Blue Hill, Munderoo State Forest, Tumbarumba, 2,500′-2,800′, sparingly distributed in open forest, 26.12.1948; 5436, Paddy's River, Tooma, slender grass in open forest, 26.12.1950. Recorded Mount Stanley (N.E. Vic.), about 3,300′, as a very slender form in hard ground (2945) on 3.1.1949. Observed only in montane areas.

Pentapogon *R. Br.*

P. quadrifidus (*Labill.*) *Baill.* 1333, 2836, Murray's Crossing, Tumbarumba, on swampy flats of Tumbarumba Creek, about 2, 000′, scattered amongst marsh flora in shady situation; fairly plentiful though diffuse, 2.1.1948, 27.12.1948; 2832, 3960, The Glen (Munderoo), 12 miles S.W. of Tumbarumba, on margin of soakage from spring, fairly plentiful amongst marsh flora, 26.12.1948, early fl. 7.11.1949; 5339, Munderoo South, near Tumbarumba, diffuse but not uncommon on roadsides, favouring swampy depressions, mostly early fl. 12.11.1950. Fl. Nov.-Dec. Observed in swampy areas at Munderoo Creek, Mannus.

Observed only in the Tumbarumba district, and there confined to moist localities and of diffuse distribution. Often inconspicuous amongst other herbage.

Aira *L.* "Silvery Hair Grasses"

* **A. cupaniana** *Guss.* 931, The Glen, Tumbarumba, common in grassland, 25.12.1946; 1147, Carboona Gap, Tumbarumba, rocky banks, 18.10.1947; 3658, 9-Mile Hill, Wagga Road, Albury, early fl. 2.10.1949; 3714, Horse Shoe Lagoon, Albury, 7.10.1949. Fl. Sept.-Dec.

Very widespread. An early spring grass, it gives a silvery appearance to many pasture paddocks for several weeks until overtaken by other herbage species.

* **A. caryophyllea** *L.* 5765, Wymah Gap, Wymah, clumps in moist spots, mostly mature, 29.11.1951. Distribution in the area unknown.

Molineria *Parlat.*

* **M. minuta** (*Loefl.*) *Parlat.* 1086, Holbrook, pasture, 28.9.1947; 3528, Comer Reserve, 6 miles S.W. of Henty, dense clumps in roadside drain, 5.9.1949; 1976, 4839, Lehmann's Reserve, Walla, on margin of swamp, earliest fl. 9.9.1948, 23.9.1950; 4754, Bake's Reserve, Gerogery, occasional fl. plants at margin of swamp, 13.8.1950; 5527, Hume Highway, Mullengandra, roadsides, 13.9.1951; 5525, Burrumbuttock Road, Walla Walla, roadsides, 12.9.1951; 5526, Fowler's Swamp Reserve, Wymah, grassland, 13.9.1951. Fl. Aug.-early Oct.

Widespread and well established. Similar in habit to *Aira cupaniana* and easily overlooked on that account, except for the purple colouration in *Molineria* and the absence of an awn on closer examination.

Avena *L.*

* **A. fatua** *L.* "Black Oat". 935, Woomargama, 13.12.1946; 1764, Gerogery, 8.6.1948; 3407, Henty, trucking yards, large patches in flower, 28.7.1949; 3377, Monument Hill, Albury, 18.6.1949. Fl. irregular.

Widespread weed of waste places and cultivated land.

* **A. barbata** *Brot.* "Bearded Oat". 2528, Albury, railway embankment, 7.11.1948; 2734, Monument Hill, Albury, 5.12.1948.

Widespread but not as common as *A. fatua.*

* **A. sativa** *L.* "Oat". Extensively cultivated. Spontaneous in cultivated land and occasionally in gardens.

Holcus *L.*

* **H. lanatus** *L.* "Yorkshire Fog". 936, "Sour Flat" Reserve, Little Billabong, 14.12.1946. Observed at Wymah and Albury gardens. Very common in swamps and marshy areas in the Tumbarumba district, less so in areas under 1,000′, but fairly plentiful along the Upper Murray Valley. Generally considered to be of low pasture value, but useful in peat swamps of higher elevations.

Amphibromus *Nees*

A. neesii *Steud.* "Swamp Wallaby Grass". 4302, 4303, The Glen, Tumbarumba, roadside drains, 27.12.1949; 889, Little Billabong, in moist situations, 12.1946; 728, 874, Culcairn Road, Holbrook, plentiful in moist places and roadsides, 15.3.1947, 21.12.1946; 937, Holbrook, 16.12.1946; 1264, Holbrook, on dry elevated creek bank, atypical, 14.12.1947; 4628, ½ mile S. of Albury Railway Station, little flowering in railway ditch, 30.4.1950. Abundant flowering material in dams and swamps in Henty district on 12.5.1950; 5139, Wallandool, near Urangeline, rooted in mud of shallow pools in grassland; cleared *Callitris—Eucalyptus albens* woodland, 18.10.1950; 5100, Bulgandry Reserve, Bulgandry, swamp grass, 16.10.1950. 4245, Cemetery Reserve, Henty, margins of marshy area, 9.12.1949. Fl. mainly March, to small degree throughout the year with favourable seasonal conditions.

Widespread in swamps and lagoons in areas less than 1,000′, but extending to the tablelands. Provides a coarse, useful fodder in its usual habitat.

A. gracilis *P. F. Morris.* 1257, Walwa, margin of lagoons, "near *A. gracilis*", 5.12.1947; 2955, Ettamogah, north of Albury, plentiful in hard clay of dam bed, 9.1.1949; 1670, Howlong Road, Albury, in mud, 14.4.1948; 4351, 4372, Waterworks Reserve, Albury, common, semi-prostrate masses in mud of lagoons, with *Potamogeton* and *Pseudoraphis,* 13.1.1950, 15.12.1949. Fl. Dec.-April.

Collected only in land subject to periodical inundation and there quite plentiful, e.g., margins of lagoons and dam beds with a large seasonal rise and fall. Not observed in localities other than those cited.

Schismus *Beauv.*

* **S. barbatus** (*L.*) *Thell.* 5579, Bulgandry Reserve, Bulgandry, not common in grassland, 8.10.1951.

Arrhenatherum *Beauv.*

* **A. elatius** (*L.*) *J. et C. Presl.* var. **bulbosum** (*Willd.*) *Spenner.* "Bulbous Oat Grass". 951, Woomargama, spontaneous in garden, 8.1.1947. Uncommon.

Danthonia *DC.*

D. carphoides *F. Muell.* 384, Holbrook, grass of drier pastures, 13.12.1946; 998, 6-Mile, Billabong Road, Holbrook, in hard clay of roadside, 30.4.1946; 2618, Bell's Road, Gerogery, relatively common on hard ground of roadside, 17.11.1948; 2560, 5063, Thurgoona, common on hard drier ground of roadside, 9.11.1948, 10.10.1950. Fl. late spring-autumn.

Incidence unknown. Rather insignificant grass, but hardy, prefering the drier portion of grasslands.

D. penicillata (*Labill.*) *Beauv.* 2863, 2870, Laurel Hill, Tumbarumba, 3,000′-3,300′, on grassy slope at margin of forest, 27.12.1948. Not observed elsewhere.

D. pallida *R. Br.* "Snow Grass". 2821, Blue Hill, Munderoo State Forest, Tumbarumba, 2,500′-2,800′, not plentiful in forest, 26.2.1948; 5454, Paddy's River, near Tooma, open forest, 26.12.1950; 377, 1243, Woomargama, Tunnel Road, plentiful in forest, 20.12.1946. 26.11.1947. Recorded 2936, Yackandandah (Vic.) 3.1.1949.

Common in areas of higher elevation, at least over 1,000′, in forest lands. A coarse species forming tussocks up to 6′ high and characterised by red anthers.

D. racemosa *R. Br.* 789, Tumbarumba, garden, 5.4.1947; 798, Tunnel Road, Woomargama, common on roadside, 10.4.1947; 830, Holbrook Park, on moist shady bank with *Microlaena stipoides,* 2.4.1947; 2966, Billabong Creek, Rand, plentiful on shady creek bank, grey sandy loam, 10.1.1949; 3217, Howlong, plentiful in heavily grazed paddock, 1.4.1949; 2555, Table Top, on moist grassy hillside, 10.11.1948; 4196, 9-Mile Hill, Wagga Road, Albury, shaded situation under granite rocks, 3.12.1949. Fl. Oct.-April.

Widespread and a constituent of most grasslands in the area. Appears to have no specific habitat.

D. pilosa *R. Br.* 2848, Laurel Hill, 3,000′-3,300′, plentiful on roadside, 27.12.1948; 2820, Blue Hill, Munderoo State Forest, Tumbarumba, 2,500′-2,800′, plentiful in open forest, 26.12.1948; 386, Tumbarumba, common pasture grass, 12.12.1946; 815, 827, 3998, The Glen, Tumbarumba, common grass in subterranean clover pastures, 5.4.1947, 7.4.1947, 9.11.1949; 1294, Carboona Gap, Tumbarumba, about 1,500′, common on rocky banks, 26.12.1947; 385, "Sour Flat" Reserve, Little Billabong, in grassland, 14.12.1946; 1244, Woomargama, common roadside grass, 26.11.1947; 3327, 14-Mile Reserve, Howlong Road, Albury, end of fl. 6.6.1949; 3181, Doctor's Point, Albury, on margin of stone quarry, regrowth after recent rains, 21.3.1949. Recorded for Mt. Stanley (N.E. Vic.), about 3,300′, sparingly distributed in shady forest land, 3.1.1949. Fl. Nov.-March, later in secluded spots to late June, or after recent rains in summer.

The commonest species of *Danthonia* of the area with no specific habitat; it provides a major proportion of pasture feed for the greater part of the year. It is adaptable to the high soil phosphorus values of heavily super-phosphated soils, as shown by Nos. 815 and 827, as well as to the poorer soils of ridges. In heavily rabbit-infested country, it exhibits a hardiness equal to that of *Cheilanthes tenuifolia* in withstanding the depredations of this pest.

D. eriantha *Lindl.* 2843, The Glen, Tumbarumba, about 2,300′, fairly plentiful in open forest, 26.12.1948; 388, Holbrook, sub-dominant grass, 16.12.1946; 1139, Hume Highway, Holbrook, in moist clay of roadside, 10.10.1947; 1242 (in part), 1245, Woomargama, common roadside grass, 26.11.1947; 4209, Brocklesby, common in drier grasslands, 1.12.1949; 2554, Budgi Trig. Station Hill, Table Top, on grassy slope, 10.11.1948; 2508, 2505A, 2509, Monument Hill, Albury, plentiful, 7.11.1948. Recorded on hillsides at Leneva (Vic.) on 1.12.1948. Fl. Oct.-Dec.

Widespread and common throughout the area. Akin to *D. pilosa* as a dominant species in most pastures.

D. auriculata *J. M. Black.* 378, Tunnel Road, Woomargama, 22.12.1946; 4247, Cemetery Reserve, Henty, common in drier parts of grassland, 9.12.1949; 2460, 80-Acres Reserve, Gerogery, plentiful, 1.11.1948; 1188, 2545, Table Top, on roadsides, 21.10.1947, 10.11.1948. Possibly widespread, but not a common species.

D. setacea *R. Br.* 1175, 1209, Holbrook, tussocky on hard gravel, and hard clay bank of drain, 26.10.1947, 2.11.1947; 4366, Grubben Reserve, N. of Henty, plentiful in dry grassland, mostly mature, 6.1.1950; 4246, Cemetery Reserve, Henty, drier parts of grassland, 9.12.1949; 1825, 4549, Henty, moist clay of road drain, most plants dead or over-mature, 4.6.1948; in grassland, fl. 3.3.1950; 3909, Culcairn, clay silt of roadsides, full fl. 31.10.1949; 1236, 4662, Burrumbuttock, 6.11.1947, 26.6.1950; 4702, Brocklesby Road, Walbundrie, in roadside drain, 14.7.1950; 771, 2-Mile Reserve, Holbrook, in swamp, 28.3.1947; 1225, Lehmann's Reserve, Walla Walla, on hard gravel bank of stock dam, 30.10.1947. Fl. Oct.-Jan. and to a small degree all the year.

Widely spread in areas less than 1,000′, preferring gravelly or rocky situations but a fair degree of moisture. Distinctive in the field by the reddish purple tinge of the spikelets when mature.

D. duttoniana *Cashmore.* 4306, The Glen, Tumbarumba, moist roadside drain, 27.12.1949; 3234, Pleasant Hills Road, Henty, plentiful in moist yellow clay of roadside, mostly over-mature, 11.4.1949; 2538, Henty, near trucking yards, 11.11.1948; 1233, Burrumbuttock, common in roadside swamp, 6.11.1947; 1164, 2-Mile Reserve, Holbrook, semi-prostrate in water, 11.10.1947; 1180, Holbrook Government Tank, swampy situation, 26.10.1947; 379, Woomargama, 13.12.1946; 3187, Bake's Reserve, Gerogery, margin of permanent swamp, flowering material scarce, 25.3.1949; 2643, 80-Acres Reserve, Gerogery, common in moist spots of spring pasture, 1.11.1948; 4653, Cemetery Reserve, Henty, in swamp, fl. material fairly common, 9.6.1950; 4626, Albury, railway line, little fl. in ditches, 30.4.1950. Fl. Oct.-March, mostly in spring and again in summer but to a minor degree for the remainder of the year.

Widespread and most common in areas under 1,000′. Abundant along roads in the Burrumbuttock, Rand, Walbundrie and Goombargana districts. Prefers moist poorly-drained soils, and never observed in drier areas, with optimum development in swamps. Rather a coarse species with little flag. The boat-shaped leaf tip is a useful characteristic for recognition in the field.

D. richardsonii *Cashmore.* 2675, Henty Township, in public parkland, 26.11.1948; 2737, Burrumbuttock, fairly plentiful on roadside, 3.12.1948; 1226, Walla Walla Road, Albury, light green grass on roadsides, 30.10.1947; 3229, Jindera-Walla Walla Road (16 miles) common along course, 8.4.1949; 1184, Table Top, roadside drain, 21.10.1947. Flowering material has been observed at Burrumbuttock, 27.6.1949; Walla Walla, 5.8.1949; Monument Hill, Albury, 26.8.1949; railway embankment, Culcairn, 1.9.1949; Macauley Street, Albury, on footpath, 11.4.1949. Fl. most of the year, predominantly from Oct.-Dec.

Widespread and common at elevations less than 1,500′, confined mainly to little-grazed areas. Characterised by the glaucous-green overall appearance and the whiteness of the mature spikelets compared with the usual straw colour of other species.

D. linkii *Kunth* var. **fulva** *Vickery.* 1000, Mountain Creek, Holbrook, tall grass on roadside, 29.4.1947; 799, Tunnel Road, Woomargama, 10.4.1947; 383, Holbrook Cemetery, 18.12.1946; 1256, Holbrook, open paddock, 6.12.1947; 4734, Hovell Reserve, 4 miles W. of Burrumbuttock, in grassland, 3.8.1950; 4687, Brocklesby, waste land of roadsides, little fl. 14.7.1950; 2649, Jindera, open forest prefering sheltered situations, 23.11.1948; 3159, Table Top, in yellow clay of railway drain, late summer regrowth after recent rains, 19.3.1949; 1840, 3333, 3412, 2506-7, Monument Hill, Albury, common, 7.8.1948, 18.6.1949, 7.8.1949, 7.11.1948, flowering at same site on 23.7.1949, 7.8.1949; 3322, Albury, garden path, fl. material uncommon, 5.6.1949. Fl. most of the year, mainly spring.

Scarcely a pasture species but commonly found in forest and heath lands in areas under 1,000′ elevation. Prior to settlement, it was probably widespread, but it is now confined to reserves, little-grazed lanes and public parklands.

D. caespitosa *Gaudich.* 4650, Cemetery Reserve, Henty, fairly common around dam banks, 9.6.1950; 4701, Brocklesby Road, Walbundrie, fair quantities fl. on roadsides, 14.7.1950; 1163, 1195, Howlong Road, Albury, roadside drains, 16.10.1947, 21.10.1947.

Widespread over the western half of the area.

D. monticola *J. Vickery.* 2504, 2677, Monument Hill, Albury, on arid gravel and moist roadside mica sand, 7.11.1948, 28.11.1948. Not observed elsewhere.

Cynodon *L. C. Rich.*

‡ **C. dactylon** (*L.*) *Pers.* "Couch Grass". 2961, Billabong Creek, Rand, 10.1.1949; 878, 1021, 6-Mile, Billabong Road, Holbrook, 16.12.1946, 30.4.1947; 770, 10-Mile Creek, Holbrook, 23.3.1947; 879, Gap Reserve, Woomargama, 13.12.1946. Observed fl., Gerogery (11.10.1949), Burrumbuttock and Rand Districts, early fl. on 14.10.1949, Bungowannah (1.2.1950). Fl. Oct.-April.

Widespread and very common in sandy soils. A valuable hardy grass, with the property of rapid regeneration after summer rains.

A correspondent to the "Border Post" of 6.10.1878 considers that: "It is generally believed that couch grass or 'Indian doub', kills all other grasses and dying away in the winter or frosty weather, has no feed value. Now if any who are curious in these matters will inspect several pastures I have, they will find a fine sward of white clover, kit grass, etc., and in March these will be dead, while the 'doub' is a thick sward over the same surface, therefore, I say it is one of the most useful fodder plants for Australia, where the autumn generally finds us with a lack of green growing grass".

"In the issue of 6.8.1884 it is recorded that Mr. Mackay, Secretary of the Albury Show Society, had sown 'rye and couch grass' on the Albury Showground with every promise of a good turf".

* **C. incompletus** *Nees.* "Blue Couch Grass". Involved in a mortality in sheep at Mahonga, N.W. of Rand in February, 1952. Specimens were determined as this species following veterinary investigations, (R. C. Denyer, personal communication). As yet not recorded within the area.

Chloris *Sw.*

C. truncata *R. Br.* "Windmill Grass". 509, 519, 734, Holbrook, common pasture grass, 1.3.1947, 21.2.1947, 15.3.1947; 902, Little Billabong, 15.12.1946; 4445, Lockhart Road, Rand, regrowth after recent rains, 9.2.1950; 892, Gap Reserve, Woomargama, 13.12.1946; 3151, Bell's Road, Gerogery, 18.3.1949. Fl. Dec.-March.

Widespread and common, tending to dominate some pastures in late summer and autumn. The dead seed heads fill watercourses and pile against fences together with those of *Panicum effusum* in late autumn. A useful pasture species making rapid regeneration after summer rains.

C. acicularis *Lindl.* 5702, ½ mile W. of Brocklesby township, frequent in dried clay loam grassland subject to seasonal flooding, 19.11.1951. Breakwell (1917, p. 523), referring to the Holbrook district, considered that "the principal Chloris grasses were *C. truncata* and *C. acicularis*". Not collected elsewhere.

* **C. gayana** *Kunth.* "Rhodes Grass". 3144, isolated clump on railway embankment, one mile north of Table Top Railway Station, several yards in diameter, 18.3.1949; 4631, ½ mile S. of Albury Railway Station, occasional plants on embankment, fl. 30.4.1950. Observed growing near a haystack at Mullengandra on 9.6.1949. Uncommon; rarely if at all cultivated in the area.

* **C. virgata** *Sw.* 4633, ½ mile S. of Albury Railway Station, in clumps, fl. 30.4.1950. Uncommon.

Eleusine *Gaertn.*

* **E. tristachya** (*Lam.*) *Lam.* 697, Holbrook Post Office, matted grass in street gutter, 7.3.1947; 1005, Wantagong School, roadside, 17.4.1947. Uncommon, not observed elsewhere.

Enneapogon *Desv.*

E. nigricans (*R. Br.*) *Beauv.* "Nigger Heads". 1219, Walla Walla, sparsely distributed on dry bank, 30.10.1947; 4681, Brooklyn Bridge, Walla Walla, common in sandy soil, mature and immature, 29.6.1950; 2662, Brae Springs, Gerogery, not common, on dry sedimentary formations, 24.11.1948; 3244, Mullengandra, fairly common in poorer soils on ridges and hillsides with *Aristida ramosa*, 22.4.1949; 3143, railway embankment, Table Top, 18.3.1949; 3163, Monument Hill, Albury, in moist gravel of roadside, 20.3.1949; 1847, Eastern Hill, near Albury Saleyards, plentiful on red sedentary soil derived from mica schist and pegmatite, 17.8.1948; 3182, Doctor's Point, Albury, fairly common on rocky bank, 21.3.1949. Early flowering material observed in railway enclosure at Burrumbuttock on 23.9.1949. Fl. Aug.-April.

A hardy grass, now confined to the poorer and drier soils, mostly in the wheat belt. Common in non-cultivated lanes in the Walla Walla and Burrumbuttock areas, suggesting that it was common prior to settlement. Rabbits show little preference for this grass even in heavily infested country.

Cortaderia *Stapf*

* **C. selloana** (*Schult.*) *Aschers. et Graebn.* "Pampas Grass". 1673, Albury, cultivated in garden, 16.4.1948; 1682, Table Top, cultivated and making free growth, 21.4.1948. Observed to have become naturalised at Mullengandra on the Hume Highway. Commonly cultivated in gardens at Albury and surrounding districts. A favourite ornamental grass of the pioneers, judging by its incidence in old homestead gardens, and discernible in photographs of the Albury Botanic Gardens in the 1890's.

Phragmites *Trin.*

P. communis *Trin.* "Common Reed". 530, Billabong Creek, Holbrook, 16.2.1947; 512, Woomargama, 5.2.1947. Fl. irregular, mostly summer.

Common along creek banks, often forming dense stands around fresh water pools.

Diplachne *Beauv.*

D. fusca (*L.*) *Beauv.* 4600, Rand, railway trucking yards, occasional plants in ditches, partially submerged after recent rains, fl. 20.3.1950; 4658, 4 miles N.W. of Pleasant Hills, roadside drain, mature and immature fl. 14.6.1950.

Distribution unknown but possibly overlooked on account of its similarity to *Eragrostis parviflora* at certain stages of growth.

Tripogon *Roth*

T. loliiformis (*F. Muell.*) *C. E. Hubbard.* 507, 2-Mile Reserve, Holbrook, on hard bare ground with *Eragrostis elongata,* 1.3.1947; 3188, Bake's Reserve, Gerogery, semi-dominant in dry hard ground with *Chloris truncata,* 25.3.1949; 1820 9-Mile Hill, Wagga Road, Albury, on shallow soil over granite, 21.5.1948; 4481, Thurgoona, diffuse in grassland, 20.2.1950; 3277, Kellam's Reserve, Talmalmo (Dora Dora), common over an acre of ground, giving a reddish colouration to pasture, 30.4.1949; 4601, Fagan's Reserve, 3 miles N. of Walbundrie, dominant over large areas in drier and barer parts of grassland, 20.3.1950; 4682, Walla Walla, large patch in natural grassland, mostly dead and mature, 29.6.1950. Fl. irregular, for most of the year.

Prefers drier situations, usually in company with *Eragrostis elongata* and *Chloris truncata.* Of sporadic distribution, and occurs in patches, sufficient to give the grassland a reddish colouration in autumn. Noticeable in non-cultivated and unimproved grasslands in winter by the dead, curved culms strewn over the ground and a small proportion of young growth underneath.

Koeleria *Pers.*

* **K. phleoides** (*Vill.*) *Pers.* "Annual Cat's-tail". 3787, Rand, roadsides, 14.10.1949; 2617, Walla Walla, pasture; 17.11.1948; 3725, 3730, Gerogery, along railway line, 11.10.1949; 2546, Table Top, garden weed, 10.11.1948; 3649, 9-Mile Hill, Wagga Road, Albury, in gravel pit, 2.10.1949; 2446, Albury, garden path, 31.10.1948; 2523, Albury Trucking Yards, 7.11.1948; 3868, Bungowannah, grassland, 26.10.1949. Recorded 1457, Walwa (Vic.), on roadside, 9.11.1947. Fl. Sept.-Nov.

Very widespread and common with no special habitat. Often dwarf forms occur in dry sites of low fertility.

Dactylis *L.*

* **D. glomerata** *L.* "Cocksfoot Grass". 5409, Sweetwater Creek, Mullengandra, occasional plants along creek banks, 13.12.1950. Noted in gardens at Tumbarumba and Albury. Occasional but not common.

Cultivated over a long period as indicated by the report of the Inspector of Stock, Albury, in the Albury District Stock Report for 1883 as reported in the Border Post, 19.1.1884—Lucerne, rye grass and cocksfoot are the artificial pasture plants which are sown in the district, the first named being the most successful.

Briza *L.* "Quaking Grasses"

* **B. maxima** *L.* 2034, Monument Hill, Albury, plentiful, 18.9.1948. Widespread and common in the area.

* **B. minor** *L.* 4878, Henty, railway line, 22.9.1950; 3735, Gerogery, railway line, abundant, 11.10.1949; 3393, Walla Walla, grassland, early fl., 22.7.1949; 2035, Monument Hill, Albury; 18.9.1948.

Very widespread and common in the area.

Eragrostis *Host* "Love Grasses"

E. parviflora (*R. Br.*) *Trin.* "Weeping Love Grass". 890, 956, Holbrook, in pasture, 18.12.1946; 727, Culcairn Road, Holbrook, 15.3.1947; 4453, Lockhart Road, 5 miles N.W. of Rand, common in roadside ditches, 9.2.1950. Mostly fr. occasional fl. in Henty district on 12.5.1950. 3067, Albury, garden weed, 13.2.1949. Fl. Dec.-March, later according to seasonal conditions.

Widespread and common over most of the area, often common in fallow lands. Of value when young, it reaches its best development in moister localities.

E. elongata (*Willd.*) *Jacq.* 968, Yarrara Gap, Lankey's Creek, 6.1.1947; 489, 508, 511, 514, 695, Holbrook and environs, common in pastures, 13.12.1946; 1.3.1947 (508, 511), 6.2.1947, 7.3.1947; 2792, Bell's Road, Gerogery, common on roadside, 16.12.1948; 2705, Monument Hill, Albury, on arid ground, 28.11.1948. Fl. Dec.-March.

Widespread and common, at least at lower elevations. Seen mostly in drier and poorer pastures. A hardy grass, it is considered to be of low fodder value and not relished by stock.

E. brownii *Nees ex Steud.* 706, 818, 824, The Glen, Tumbarumba, 11.3.1947, 4.4.1947, 7.4.1947; 870, "Sour Flat" Reserve, Little Billabong, 14.12.1946; 513, 10-Mile Creek, Holbrook, in sandy creek bed, 5.2.1947; 772, 774, 869, Holbrook and environs, common pasture grass in moist situations, 28.3.1947, 16.12.1946; 871, Woomargama, 13.12.1946; 3018, 3027, Henty township, in moist sand, 25.1.1949; 3047, Bake's Reserve, Gerogery, tufted in moist peaty soil of permanent swamps, about 700′, 26.1.1949; 3064, Mungabarina Reserve, Albury, common in moist spots, 13.2.1949; 3291, Monument Hill, Albury, fl. material scarce, 8.5.1949. Fl. Dec.-April, occasionally into winter in sheltered spots.

Common and widespread, dominant in many moister pastures, especially on sandy river flats, moist sand of roadsides and along many creeks. Freely grazed by stock.

E. philippica *Jedw.* 708, The Glen, Tumbarumba, in moist roadside drainage, 11.3.1947; 872, Tumbarumba, swamp grass, 23.12.1946; 873, Coppabella Creek, Jingellic, in moist creek bed, 27.1.1947.

Apparently prefers higher elevations and is confined to very moist situations. Its similarity to *E. brownii* makes it difficult to assess its incidence in the area, whilst its usual habitat would not qualify it as a pasture species.

* **E. cilianensis** (*All.*) *Link ex Lutati.* "Stink Grass". 930, Tumbarumba, 28.12.1946; 491, Holbrook, garden weed, 7.1.1947; 3148, Culcairn, weed in garden, 18.3.1949; 3288, Albury, stunted forms in sheltered positions, 8.5.1949; 3065, Albury, garden weed, 13.2.1949. Fl. Dec.-March.

Cosmopolitan weed of cultivated land, mostly dominant in summer fallow land in the wheat areas. Commonly known as "Black Grass", on account of the dark seed heads at maturity. Of low nutritive value for grazing, but often provides a green shoot amongst dry herbage in summer. Ubiquitous in gardens.

E. australasica (*Steud.*) *C. E. Hubbard.* "Cane Grass". 5481, Lockhart Road, 3 miles N.W. of Rand, dense stands to 3′ high in "spuey" clay of roadside ditches, 2.3.1951; 2793, Dudal Comer Swamp, near Henty, acres in clumps up to 4′ high in bed of drained swamp, 17.12.1948; 1361, Corowa Road, Howlong, scarce, 13.1.1948. Confined to the western margin of the area, occurring along roads in the Rand district.

Cynosurus *L.*

† **C. cristatus** *L.* "Crested Dog's-tail". 984, 5466, Tumbarumba, lawn grass, 20.12.1946, 25.12.1950.

Lamarckia *Moench.*

* **L. aurea** (*L.*) *Moench.* "Golden-top". 2548, Budgi Trig. Station Hill, Table Top, rare in clefts between granite rocks, 10.11.1948. Uncommon.

Poa *L.*

P. caespitosa *Forst. f.* spp. aff. "Tussock Grass". 1328, Blue Hill, Munderoo State Forest, Tumbarumba, shady situation in forests, 4.1.1948; 952, The Glen, Tumbarumba, 28.12.1946; 934, Holbrook, cemetery, 13.12.1946; 1230, 2650, Jindera, 30.10.1947, 23.11.1948; 1176, 5-Mile, Howlong Road, Albury, 21.10.1947. Also recorded for several areas in N.E. Victoria. Fl. spring and summer.

A variable species or complex, widespread in its many forms. Common grass in forests, especially at higher elevations, also plentiful in poorer, unimproved pasture lands. Relatively unpalatable to rabbits and plentiful in heavily infested lands. Of some food value to stock in young growth.

* **P. pratensis** *L.* "Kentucky Blue Grass". 1284, Tumbarumba, lawn grass, 12.12.1947; 862, Munderoo Creek, Mannus, swamp grass, 23.12.1946; 1111, 10-Mile Creek, Holbrook, underherb in sandy creek bank, 12.10.1947. Fl. Oct.-Jan.

Commonly cultivated as a lawn grass and a volunteer in pastures, but not common as such at lower elevations.

* **P. bulbosa** *L.* "Bulbous Blue Grass". 1087, 1132, Hume Highway, Holbrook, plentiful on roadsides, 28.9.1947, 10.10.1947; 4879, Henty, railway line, 22.9.1950; 4391, Triangle Reserve, Brocklesby, abundant on roadsides, 25.9.1950; 5016, Tonk's Reserve, N. of Burrumbuttock, moister parts of grassland, 4.10.1950; 1191, 1998, 14-Mile Reserve, Howlong Road, Albury, common in swampy depressions in grassland, 21.10.1947, 15.9.1948; 2023, 2029, Monument Hill, Albury, plentiful, 18.9.1948. Early flowering material noted on Waterworks Reserve, Albury, on 1.10.1949, also Horse Shoe Lagoon, Albury, on 7.10.1949. In full flower and plentiful along Walbundrie-Rand Road on 14.10.1949. Fl. Sept.-Nov.

Very common at the localities cited and widespread; at least well established throughout the Slopes portion of the region.

* **P. annua** *L.* "Winter Grass". 825, Tumbarumba, swamp, 7.4.1947; 1832, Albury Municipal Stone Quarry, Howlong Road, Albury, in water, 25.7.1948. Fl. most of the year. Cosmopolitan.

Glyceria *R. Br.*

* **G. maxima** (*Hartm.*) *Holmb.* 986. Woomargama, naturalised in swamp, luxuriant growth over half an acre, 12.1.1947. Uncommon.

G. australis *C. E. Hubbard.* 6000, Mahonga, 7 miles N.W. of Rand, in water of deep, roadside pool mixed with *Amphibromus neesii,* 16.11.1952.

Festuca *L.*

† **F. rubra** *L.* "Red Fescue". 985, 1285, Tumbarumba, lawn grass, 23.12.1946, 12.12.1947; 2501, 2739, Albury, lawn grass, 7.11.1948, 5.12.1948. Apparently commonly cultivated as a lawn grass.

F. hookeriana *F. Muell.* 1332, Murray's Crossing, Tumbarumba, tall grass in swamp, about 2,200′, in company wth *F. eriopoda* and *Pentapogon quadrifidus,* 2.1.1948.

F. eriopoda *Vickery.* 1331, 2896, Murray's Crossing, Tumbarumba, about 2,200′, swamp grass, 2.1.1948, 27.12.1948; 2864, Laurel Hill, 8 miles N.E. of Tumbarumba, plentiful in swampy depression off roadside, 3,000′-3,300′, 27.12.1948; 5449, Paddy's River, near Tooma, occasional clumps in moist open forest land, 26.12.1950. Recorded by Vickery (1939, p. 10), collected at Rosewood in 1897, about 10 miles from locality of No. 1331. A montane species, characterised by the basal tuft of radical leaves and the large central stalk with seed head; only observed in swampy areas.

Vulpia *Gmel.* "Rat's-tail Fescues"

***V. myuros** (*L.*) *Gmel.* 963, Tumbarumba, pasture grass, 26.12.1946; 965, "Sour Flat" Reserve, Little Billabong, 14.12.1946; 1109, Holbrook Park, 12.10.1947; 2448, 2527, 3320, 3321, Albury, weedy grass in gardens, 31.10.1948, 7.11.1948, 5.6.1949, but flowering material rare in the latter. Fl. Sept.-Dec., rarely to June.

Widespread and common, a common constituent of spring pastures.

***V. bromoides** (*L.*) *S. F. Gray.* 932, The Glen, Tumbarumba, pastures, 25.12.1946;1291, Carboona Gap, Tumbarumba, 26.12.1947; 1169, Holbrook, 11.10.1947; 2550, 2556, Table Top, rocky slopes and roadsides, 10.11.1948; 3423, Culcairn, railway yards, flowering material rare, 8.8.1949; 2447, 2449, Albury, common garden weed, 3.10.1948. Recorded also 2915 for Mt. Stanley (Vic.), 3.300′ on shallow alluvium over granite, 3.1.1949. Fl. Oct.-Jan., most of the year in sheltered localities.

Widespread and common with no specific habitat. A common constituent of spring pastures. Collectively with its congeners cited, this species provides a useful body of feed in early spring. Locally they are known as "Hair Grasses". They have been incriminated as aetiological agents of alveolar periostitis in sheep together with *Hordeum* spp (q.v.).

***V. megalura** (*Nutt.*) *Rydb.* 2467, 9-Mile Reserve, Wagga Road, Albury, on gravel bed, 1.11.1948. Apparently less common than the preceding species.

Bromus *L.*

***B. madritensis** *L.* "Madrid Brome Grass". 3981, Tumbarumba, waste land, 8.11.1949; 860, Woomargama, plentiful on sandy creek banks, 8.12.1946; 4200, 9-Mile Hill, Wagga Road, Albury, common in gravel pit, terminal fl. 3.12.1949. Recorded 2714, Indigo Falls, Leneva (Vic.) in shady grassed glade, 4.12.1948. Fl. Nov.-Dec.

Widely spread, but incidence unknown. Observations would indicate that this is a hardy species, present in arid spots, e.g., gravel soils and dry sandy creek banks.

***B. gussonii** *Parlat.* "Giant Brome Grass". 848, 851, Holbrook, 16.12.1946, 13.1.1947; 897, Woomargama, 12.12.1946; 2450, Albury, garden weed, 31.10.1948; 2514, Monument Hill, Albury, 7.11.1948. Fl. Sept.-Jan.

Common ruderal grass, especially about towns; of poor fodder value.

***B. rubens** *L.* "Red Brome Grass". 5547, Wallandool Reserve, near Urangeline, clumps on rocky hillside, 18.9.1951; 4922, Triangle Reserve, Brocklesby, dense clump, 25.9.1950; 4769, Bulgandry Reserve, Bulgandry, roadside herbage, 21.8.1950; 5091, Jindera, in cultivation paddock, 10.10.1950; 2595, Hume Weir, Albury, on hard gravel of roadside, 14.11.1948; 2606, Howlong, on ridgy country, 19.11.1948. Fl. Aug.-Nov.

Widespread over the western half of the area.

Ceratochloa *Beauv.*

***C. unioloides** (*Willd.*) *Beauv.* "Prairie Grass". 915 Holbrook, 8.12.1946; 3420, Culcairn, railway yards, fl. material rare, 8.8.1949. Observed at numerous localities in the area, Tumbarumba, Albury, and gardens in many towns. Fl. mostly spring, but for most periods of the year in sheltered localities.

Widespread, noticeably absent from grazing lands, presumably because of its high palatability.

Various references appear in the Border Post to "Prairie Grass" and district agricultural shows figure the seed as an exhibit. At the Third Albury Show Exhibition in 1878, a prize was awarded to G. E. Mackay of Stoney Park for the best 20 lb. of prairie grass seed (Border Post, 14.9.1878).

Serrafalcus *Parlat.*

* **S. molliformis** (*Lloyd*) *Husnot.* "Soft Brome Grass". 826, Tumbarumba, common pasture grass, 7.4.1947; 850, Little Billabong, 16.12.1946; 1231, Jindera Gap, Albury, 30.10.1947. Fl. Oct.-Jan. Earliest flowering plants seen in the Henty district was on 3.10.1949; abundant flowering throughout the Rand, Walbundrie districts by 14.10.1949.

Widely spread as a sub-dominant weedy species in grasslands or waste places.

Brachypodium *Beauv.*

* **B. distachyon** (*L.*) *Beauv.* "False Brome". 4189, Howlong-Brocklesby Road, very common along roadside drains, "browning off", 30.11.1949. Common along miles of roads in the Burrumbuttock, Walbundrie, Brocklesby and Howlong districts.

Lolium *L.* "Rye Grasses"

* **L. perenne** *L.* "Perennial Rye Grass". 2128, The Glen, Tumbarumba, common in pastures, 4.10.1948; 1192, 14-Mile Reserve, Bungowannah, 21.10.1947. Fl. mostly in spring and summer, and occasionally throughout the year.

Almost ubiquitous in settled areas, and a volunteer in richer grasslands.

* **L. rigidum** *Gaudin.* "Wimmera Rye Grass". 863, Holbrook, 18.12.1946; 1154, Jingellic, 19.10.1947; 2658, Walla Walla, 24.11.1948; 2842, The Glen, Tumbarumba, in swamp, 25.12.1948; 3395, Lehmann's Reserve, Walla Walla, scarce in sheltered drain, 22.7.1949; 2657, Jindera, 23.11.1948; 2678, Albury, garden, 28.11.1948. Fl. spring, but extending throughout the year in sheltered sites.

Extensively cultivated throughout the area. A common grass in wheat fallows.

* **L. loliaceum** (*Bory et Chaub.*) *Hand.-Maz.* "Rigid Rye Grass". 2674, Henty, in cultivation paddock with *Phalaris tuberosa* L., 26.11.1948; 2986, Albury, garden weed, 22.1.1949. Incidence and distribution in the area unknown.

* **L. multiflorum** *Lam.* "Italian Rye Grass". 4882, 4 miles N. of Henty, roadside, 22.9.1950. Abundant fl. in Albury garden on 1.10.1950; 5060, Thurgoona, margins of sown pasture paddock, 10.10.1950. 2679, 2680, Albury, rank growth in garden, 28.11.1948, 12.10.1949; 4206, Mungabarina Reserve, Albury, common in river flat grassland, end of fl. 8.12.1949.

Although extensively planted from time to time it is rarely observed in heavily grazed pastures. Otherwise widespread in cultivated lands and especially gardens.

* **L. temulentum** *L.* "Darnel" or "Drake". Stated to have been common in parts of the wheat area, notably at Henty and Urangeline, but dying out—G. C. Bartlett, District Agronomist, (p.c.).

Long established in the area as indicated by the editorial in the Border Post of 11.12.1867: "Some varieties of wheat are known to be always free from rust, but the lots sold at the mills here are mostly of a mongrel description intermixed with drake, sorrel, dock and all manner of abominations. It was not very long ago that a whole family at Wangaratta were poisoned through partaking of bread, the flour of which contained a large admixture of drake".

A paragraphist from Dixon's Swamp (now Woomargama), to the same paper of 2.12.1874 remarks: "a great many farmers have deemed it advisable to mow the proposed grain crops for hay, which is thought to be the most prudent course, for the reason that they are full of rye-grass, commonly known as 'drake'".

Triticum *L.*

† **T. aestivum** *L.* " Common Wheat ". The most important and most extensively cultivated cereal in the area. Andrews (1912, p. 9) records that no wheat was grown at Albury in 1842, but supplies had to be obtained from Gundagai. One observer in 1843 noted a crop of wheat, " as high as the three-railed fence around it ", indicating that cultivation within the area commenced from about this time. By 1861 no less than 16 varieties were exhibited at the Albury Show, one collection comprising Tuscan, Lamas, Uxbridge, Stuckey's Blue and Velvet. The Agricultural Report for the Albury Police District of 1861 records 4,556 acres of grain wheat and 180 acres for hay (Border Post, 30.4.1862).

By 1866, James Wyse wrote to say " the rust has appeared in his wheat crops at Howlong ". Mention is also made of rust in crops at Newtown near Albury in the same issue (31.10.1866). In the issue of 7.12.1863, some three years earlier, the wheat at Ten Mile Creek (now Holbrook), " as elsewhere had not escaped the disease known as rust ", whilst in the following week " the rust was spreading fearfully in wheat crops about Albury ". By 1874 it was learnt " that the disease Takeall had made its appearance in some places amongst the wheat at Jindera, but not to any considerable extent " (Border Post, 14.10.1874). The Tumbarumba correspondent to the issue of 21.3.1890 stated that district farmers were no better off than elsewhere for the majority of wheat crops suffered from rust and the grain, as a result, was much pinched.

Parapholis *C. E. Hubbard*

* **P. incurva** (*L.*) *C. E. Hubbard.* 4274, Walbundrie, not common in moist clay of roadside, 20.12.1949

Monerma *Beauv.*

* **M. cylindrica** (*Willd.*) *Coss.* 4182, Ryan, near Henty, not common around swamp, 3.12.1949; 5393, Cemetery Reserve, Henty, in mud or hard clay margins of swampy depressions in grassland, 24.11.1950; 2664, Lehmann's Reserve, Walla Walla, on margin of swamp, 24.11.1948; 5402, Gerogery Road, Jindera, in mud of semi-permanent soakage off roadside, 28.11.1950.

Throughout the western half of the area, in swampy depressions and land subject to periodical inundation.

Agropyron *Gaertn.*

A. scabrum (*R. Br.*) *Beauv.* " Wheat Grass ". 831, 901, 913, Tumbarumba and environs, common in pastures, 5.4.1947, 12.12.1946, 23.12.1946; 849, Little Billabong, 12.12.1946; 894, 900, 940, Holbrook and environs, 16.12.1946, 7.12.1946, 18.12.1946, 7.12.1946; 891, Culcairn Road, Ralvona, 21.12.1946; 4794, Balldale, in little used lane, fl. 25.8.1950; 4739, Cemetery Reserve, Henty, grassland, occasional fl. 4.8.1950; 4655, Budgi Trig. Station Hill, Table Top, fair amount fl. in little grazed paddock, 20.5.1950. Fl. mainly Oct.-April, but with considerable latitude according to seasonal conditions.

Widespread and common grass throughout the area, often an important constituent of grasslands. Of no specific habitat, growing even on dry rocky sites. A variable grass, sometimes assuming a distinct blue colouration, at other localities dwarfed and indistinctive.

* **A. repens** (*L.*) *Beauv.* " Quack Grass ". 881, 992, Woomargama, spontaneous growth in garden, 8.1.1947, 16.1.1947. Uncommon.

Hordeum *L.*

* **H. leporinum** *Link.* "Barley Grass". 518, 904, 926, 933, 939, Holbrook, 21.2.1947, 18.12.1946. Fl. Sept.-Dec., but for most of the year in sheltered sites. Small patch observed in full fl., Walla Walla Saleyards on 29.6.1949; patches in full fl., Henty Trucking Yards, 28.7.1949; full fl. Albury district, mid-October, 1949; commencing to "brown off" in Rand-Walbundrie district in mid-October, 1949.

Widespread and very common in arable land. Thrives on the more fertile soils, with maximum development on cultivated land, gardens, sheep camps, saleyards and haystack enclosures. Incriminated with *Vulpia* spp. as aetiological agents of alveolar periostitus in sheep, the awns penetrating the gums and teeth alveoli, setting up bacterial infections. Dominant in many pastures from November to February, especially if favoured by a series of early spring frosts. Germinates and produces an ephemeral body of feed after summer rains, but rarely flowers.

* **H. hystrix** *Roth.* 3326, 14-Mile Reserve, Howlong Road, Albury, 6.6.1949; 3394, "Brae Springs" Reserve, Walla Walla, in damp depressions of grassland, 22.7.1949. Incidence unknown.

Phyllostachys *Siebold et Zucc.*

† **P. aurea** (*Carr.*) *Riv.* 1691, Albury, spontaneous in garden, may be this species, 26.4.1948.

Various members of the Bambuseae have shown a tendency to become naturalised, notable examples being around an ornamental lake at Woomargama, and a railway embankment south of Gerogery.

CYPERACEAE

Kyllinga *Rottb.*

K. brevifolia *Rottb.* "Mullumbimby Couch", "Kyllinga". 370, Tumbarumba, common swamp plant, 23.12.1946; 550, The Glen, Tumbarumba, common sedge, 24.2.1947; 4527, Wymah Gap, 25 miles E. of Albury, common in swamps, early fl. 28.2.1950; 1028, Woomargama, 12.12.1946; 3045, Bake's Reserve, Gerogery, clumps in swamp, about 700′, 26.1.1949. Fl. Dec.-March.

Widely distributed, but most common at the higher elevations. A dominant sedge in swamps throughout the Tumbarumba district and parts of the Upper Murray Valley, but sparsely distributed at elevations less than 1,000′. Always associated with a rank sour odour, but this is lost in the drying process.

Pycreus *Beauv.*

P. sanguinolentus (*Vahl*) *Nees.* 373, The Glen, Tumbarumba, plentiful in swamps, 1.1.1947; 719, Ournie, Upper Murray, in roadside seepages, 17.3.1947; 1031, Holbrook, 16.12.1946; 3242, Mullengandra, plentiful in swamps, 22.4.1949; 1434, Wymah, on moist shore of Hume Reservoir, 26.2.1948; 4533, Wymah Gap, abundant in swamps, 28.2.1950; 1446, Bethanga Bridge, Albury, 1.3.1948; 3385, Lehmann's Reserve, Walla Walla, scarce at time of collection, sheltered in tall herbage, mature and immature, 29.6.1949. Fl. Dec.-March, to April at higher elevations or in sheltered sites.

Present in most swamps and soakages throughout the area. Dwarf forms are present in locations subject to rapid dehydration, and may not exceed 2″ in height.

P. globosus (*All.*) *Reichb.* 556, 1483, The Glen, Tumbarumba, 2,250′-2,500′, in permanent soakage, 24.2.1947, 29.3.1948; 721, Ournie, Upper Murray, moist roadside drainage, 17.3.1947; 740, 10-Mile Creek, Holbrook, early fl. 23.3.1947; 3043, 3308, Bake's Reserve, Gerogery, in moist peaty soil of swamp, over ¼ acre, 26.1.1949, 16.5.1949; 3384, Lehmann's Reserve, Walla Walla, over-mature, soakage from spring, 29.6.1949. Recorded No. 5504, Beechworth Road, Wodonga, in permanent soakage off roadside, rooted in mud, localised patch, fl. and fr. 26.3.1951. Fl. Jan.-April.

Prefers permanent swamps, and occurs as isolated patches in the Tumbarumba district and parts of the Upper Murray, e.g., Tooma and Khancoban, but quite plentiful at these individual localities. Sporadic in the wheat areas.

Cyperus *L.*

C. tenellus *L.f.* 1199, Holbrook, 2.11.1947; 2593, Lehmann's Reserve, Walla Walla, plentiful in overflow from stock tank, 17.11.1948; 2561, 2586, Gerogery, shallow roadside pools, 11.11.1948, 17.11.1948; 1228, Jindera, roadside, 30.10.1947; 1177, Table Top, 21.10.1947; 5356, Tunnel Road, Woomargama, swampy depression on roadsides, 18.11.1950; 5039, Jindera Road, Gerogery, margin of swamp, 6.10.1950; 2468, 9-Mile Hill, Wagga Road, Albury, dwarfed forms in gravel pit, 1.11.1948. Recorded 2926, Stanley Road, Beechworth (Vic.), about 2,000′, 3.1.1949. Fl. Oct.-Jan.

Widely distributed over areas less than 1,000′, often present in abundance in roadside drains and moist depressions in pastures, mixed with the smaller species of *Scirpus*.

C. difformis *L.* 552, 10-Mile Creek, Holbrook, in sandy creek bed, 5.2.1947; 773, 2-Mile Reserve, Holbrook, 28.3.1947; 1372, Tooma, common in swampy ground, 12.2.1948; 5476, Walla Walla, along dam banks, early fl. 10.1.1951; 3309, Bake's Reserve, Gerogery, 16.5.1949; 1697, 14-Mile Reserve, Bungowannah, 9.4.1948. Recorded 1422, Bandiana (Vic.), 21.2.1948. Fl. Feb.-May.

Widespread and common, especially along the Murray River. Mature and young plants often occur together, suggesting an extended growth period.

‖ **C. rotundus** *L.* "Nutgrass". 1321, 1438, Albury Botanic Gardens, footpath and in flower beds, 31.12.1947, 26.2.1948. Fl. Dec.-Feb.

Widespread in the Albury City Area, extensively established in the cemetery. Observed to be plentiful on the Hume Weir Embankment on 16.1.1948. Reported to be present in some Culcairn gardens.

C. exaltatus *Retz.* 5520, Fowler's Swamp Reserve, Wymah, to 5′ high, occasional clumps along watercourses, 23.4.1951; 3116, Billabong Creek, Rand, in clumps along creek bed, 25.2.1949; 1454, Horseshoe Lagoon, Albury, 28.2.1948. Recorded 1442, Bandiana (Vic.), 21.2.1948. Fl. Feb.-April, but the mature heads presist to June.

Plentiful along the banks and lagoons of the Murray River, but sparingly distributed along the tributary creeks. Mature plants observed along banks of Mullengandra Creek on 6.7.1949, and isolated plants occur along the Billabong Creek at Holbrook. Rare away from the Murray.

* **C. eragrostis** *Lam.* 1385, Holbrook, garden weed, 29.1.1948; 1412, Gerogery Road, Culcairn, about ¼ acre of almost pure stand in roadside drain, 12.2.1948; 1379, 1383, 1672, 4-Mile, Howlong Road, Albury, common in moist pastures, 4.2.1948, 14.4.1948; 1456, Horseshoe Lagoon, Albury, 28.2.1948; 1322, 1384, Albury, garden weed, 31.12.1947, 1.2.1948; 1270, Khancoban, Upper Murray, 17.12.1947. Recorded 1266, Murray Valley Highway, Towong (Vic.) 12.12.1947. Fl. Jan.-March, but flowering and a small amount of fruiting material may persist in sheltered situations for most of the year.

Noted at Burrumbuttock, over-mature on 28.6.1949; Walla Walla, over-mature, 10.8.1949; full flower, Jindera and Wodonga (Vic.), 15.1.1949; abundant in Noreuil Park, Albury, 20.2.1949.

Very common at localities cited, and distributed along the course of the Murray River from Bringenbrong to Howlong, and lands adjacent thereto.

† **C. albostriatus** *Schrad.* This ornamental sedge, native of South Africa, is cultivated in gardens at Holbrook, Jindera, Gerogery and Albury.

C. gymnocaulos *Steud.* 2794, Dudal Comer Swamp, Henty, large clumps on sandy margins, 17.12.1948; 2780, margin of Oil Tree Lagoon, Balldale, clumps in sandy ground, 13.12.1948; 3028, stock route opposite Henty Common, dense stands, waist high, covering ¼ acre in sandy soil. 25.1.1949.

Probably confined to these localities in the western section of the area. Rare, if present, in the remainder of the area.

Mariscus *Gaertn.*

M. lucidus (*R. Br.*) *C. B. Clarke.* 364, Carboona Gap, Tumbarumba, tall sedge, luxuriant in dense clumps to 6′ high, 16.12.1946; 1069, Garry Owen Reserve, Holbrook, 18.1.1947; 374, Gap Reserve, Woomargama, 13.12.1946; 1339, Murray's Crossing, Tumbarumba, 2.1.1948. Recorded 1267, Murray River, Towong (Vic.), 12.12.1947.

Fl. Dec.-Feb., but material in bud may be seen two months earlier.

Common along the Murray River, ascending to the tableland portions. Rare or absent from areas west of Holbrook excluding the Murray River.

M. gunnii (*Hook f.*) *C. B. Clarke.* 1298, The Glen, Tumbarumba, very common, forming dense stands along roadsides, 26.12.1947; 363, 1265, 10-Mile Creek, Holbrook, common sedge, 13.12.1946, 14.12.1947; 2965, Billabong Creek, Rand, grey sandy loam of creek banks, 10.1.1949; 3023, Stock route, Henty, tufts in sandy soil, 25.1.1949; 3000, Murray River, Albury, 22.1.1949. Fl. Dec.-Feb.

Widespread and common throughout the area, often forming dense stands on marshy ground and along watercourses. This species is hardy and has held its own against the effects of settlement.

M. rutilans *C. B. Clarke.* 1444, Bethanga Bridge, Albury, in mud of soakage, 1.3.1948. Recorded 1303, Walwa (Vic.) in roadside drainage, 27.12.1947. Distribution not known.

Scirpus *L.*

S. fluitans *L.* 5400, Gerogery Road, Jindera, with *Eleocharis pusilla* under dense marsh flora in semi-permanent soakage off roadside, 28.11.1950.

S. crassiusculus (*Hook. f.*) *Benth.* 5416, 5423, 5428, Munderoo West Creek, Wolseley Park, erect in sand, semi-floating elongated masses or submerged, tangled masses in bed of swift-flowing stream, 2,200′-2,500′, 27.12.1950.

S. australiensis (*Maiden et Betche*) *S. T. Blake.* 1198, Holbrook, 2.11.1947; 5114, 5117, 5119, Wallandool, near Urangeline, swampy depressions in grassland, 18.10.1950; 5101, 5127, Bulgandry Reserve, Bulgandry, common in swamps, 16.10.1950; 4285, Ryan, near Henty, in clay pans, mixed with *Scirpus* spp., 3.12.1949; 5385, Cemetery Reserve, Henty, inflow of stock tank, sheltered by tall herbage, 24.11.1950; 5407, Mullengandra, swampy depressions in gully, under tall marsh flora, 13.12.1950; 2559, Gerogery, rooted in mud of shallow roadside pool, 11.11.1948; 5122-3, Jindera, swampy depressions in grassland, 17.10.1950; 5071, Monument Hill, Albury, muddy pools at base of old gravel excavations, 15.10.1950. Fl. Oct.-Dec.

Widespread over elevations less than 1,000′, in each case occurring with other members of the Section *Isolepis*. Observations suggest that it is seen to the best advantage during the month of November.

S. platycarpus *S. T. Blake.* 2558, Gerogery, semi-submerged in shallow roadside pool, 11.11.1948; 2585 (in part), Gerogery, roadside drain, mixed with *S. calocarpus,* 17.11.1948; 5124 (in part), Jindera, swampy depressions in grassland, 17.10.1950; 5108, Monument Hill, Albury, muddy pools in scrub land, 15.10.1950. Recorded by Blake (1940, p. 180) collected by Wilson in 1890 at Albury. Fl. Oct.-Nov.

In each case mixed with *S. calocarpus* and not distinguishable from that species on field appearance. Mass collections would be necessary to define its incidence and distribution but it is apparently not as common as *S. calocarpus.*

S. calocarpus *S. T. Blake.* 1287, The Glen, Tumbarumba, in mud, 26.12.1947; 2835, Murray's Crossing, Tumbarumba, about 2,200′, 27.12.1948; 1074, 1178, 1200, 1205, Holbrook and environs, a common swamp sedge, 16.12.1946, 26.10.1947, 2.11.1947; 4518, Wymah Gap, 25 miles E. of Albury, sheltered under tall herbage in marsh, occasional plants, about 1,000′, 28.2.1950; 5357, Tunnel Road, Woomargama, roadside depressions, 18.11.1950; 5118, Wallandool, near Urangeline, swampy depressions in grasslands, 18.10.1950; 4845, Lehmann's Reserve, Walla Walla, diffuse in grassland, fl. and fr. 23.9.1950. Recorded for Walwa (N.E. Vic.) in shady culvert, 27.12.1947. Fl. Sept.-Nov., less so to February.

A widespread and common sedge throughout the entire area, akin to *S. inundatus* in so far as it is present in most swamps or moist sites.

S. cernuus *Vahl.* 4284 (in part), Ryan, near Henty, swampy depression in grassland paddock, mixed with *S. calocarpus,* 3.12.1949. Not observed elsewhere in the area.

S. merrillii (*Palla*) *Kuekenth. ex Merrill.* 2872, Laurel Hill, about 3,300′, in dense tufts in water race, 27.12.1948; 2815, Blue Hill, Munderoo State Forest, Tumbarumba, 2.500′-2,800′, diffuse in dry bed of ephemeral watercourse, 26.12.1948; 555, 2-Mile Reserve, Holbrook, 12.2.1947; 1315, 2831, 2868, The Glen, Tumbarumba, about 2,000′, common in swamps, 26.12.1947, 25.12.1948, 26.12.1948; 4526, Wymah Gap, 25 miles E. of Albury, under swamp herbage, not common, 28.2.1950. Recorded 2716, Indigo Falls, Leneva (Vic.), soft mats in moist sand of creek bed, 4.12.1948, and ascending to Mt. Stanley, 2919, 2923-24, 3.1.1949. Fl. Nov.-Feb.

Widely spread except in the western half of the area, and common at most localities listed.

S. antarcticus *L.* 3955, The Glen, Tumbarumba, open forest grassland, 7.11.1949; 4885, 5 miles N. of Henty, diffuse in grassland on rocky hillside, 22.9.1950; 4869, 2 miles S.W. of Balldale, diffuse in sandy soil of *Callitris glauca* forest, 24.9.1950; 5051, Ryan, near Henty, clay loam grassland, 13.10.1950; 5109, Burrumbuttock, swampy depressions on roadsides, 18.10.1950; 5062, Thurgoona, scattered in grassland, 10.10.1950; 2109, 2623, Monument Hill, Albury, on open bare ground and grassy hillside, on mica schist, 27.9.1948, 21.11.1948; 2805, Albury, soakage under leaking garden tap, 19.12.1948. Fl. Sept.-Dec.

Widespread but tending to a diffuse distribution and not confined to a specific habitat. A common constituent of moist spring pastures and not confined to sites of high soil moisture. One of the earliest flowering species of the section *Isolepis* in the area.

S. inundatus (*R. Br.*) *Poir.* 2854, Laurel Hill, about 3,300′, 27.12.1948; 2866, Blue Hill, Munderoo State Forest, Tumbarumba, 26.12.1948; 2898, Munderoo Creek, Mannus, along creek banks, 28.12.1948; 797, The Glen, Tumbarumba, 7.4.1947; 561, "Sour Flat" Reserve, Little Billabong, 24.2.1947; 553, 10-Mile Creek, Holbrook, 5.2.1947; 1204, Holbrook, 2.11.1947; 2626, 2935, 3386, Lehmann's Reserve, Walla Walla, forming matted clumps in soft ooze in swamp, 17.11.1948, 31.12.1948, mature and immature material on 29.6.1949 (3386). Fl. Nov.-April, to June or later in sheltered sites.

Widely spread and a common sedge throughout the area.

S. inundatus (*R. Br.*) *Poir.* var. (aff. var. **floribundus** *Benth.*). 2866, Blue Hill, Munderoo State Forest, Tumbarumba, 2,500′-2,800′, on dry bed of ephemeral watercourse, 26.12.1948; 2834, Murray's Crossing, Tumbarumba, about 2,200′, 27.12.1948; 5429, Munderoo West Creek, Wolseley Park, clumps in moist sand of creek bed, 2,200′-2,500′, 27.12.1950.

Recorded only from these montane localities.

S. validus *Vahl.* 4314, Munderoo Creek, Mannus, clumps here and there along stream, fl. 27.12.1949; 358, 3272, Lankey's Creek, up to 6′ high as dense clumps, mostly rooted in running water, 23,12,1946, 25.4.1949; 4591, Mullengandra Creek, clumps along stream, fl. and fr. 11.3.1950. Fl. Dec.-April, at least.

Scattered along the tributary creeks of the Murray River, and most probably along the Murray itself.

S. maritimus *L.* 371, 10-Mile Creek, Holbrook, in sandy creek bed, 13.12.1946; 359, Welaregang, Murray River, 27.12.1946; 1366, Towong Bridge, Murray River, common sedge in backwaters, 22.1.1948; 4507, Cumberoona Reserve, Bowna, tall dense stands along watercourse, with *Typha* sp., 28.2.1950.

Plentiful along banks and lagoons of the Murray River, sparingly distributed on the shores, rare or absent in the slopes or tableland portions of the area.

Lipocarpha *R. Br.*

L. microcephala (*R. Br.*) *Kunth.* 3261, Munderoo Creek, Mannus, sparingly distributed in soakage, 2,200′-2,500′, end of fl. 25.4.1949; 560, Billabong Creek, Holbrook, sandy creek bed, 16.2.1947; 739, 10-Mile Creek, Holbrook, sandy creek bed, 23.3.1947; 1416, Howlong Common, plentiful along banks of Murray River, 23.2.1948; 3208, Mungabarina Reserve, Albury, common in moist sand, 3.4.1949. Fl. Feb.-April.

Widespread and present in most moist, sandy localities, but often hidden by a dense sedge flora. Common along the Murray River.

Eleocharis *R. Br.*

E. sphacelata *R. Br.* 1323, Taradale Road Crossing, Rosewood, in clumps along creek, 2.1.1948; 1268, Towong Bridge, Murray, abundant in water, 12.12.1947; 1381, Howlong Road, Albury, dense clumps in lagoon, 4.2.1948. Fl. Dec.-March.

Widespread and very plentiful in shallow lagoons and anabranches of the Murray River, often forming pure stands, acres in area. Invariably rooted in water and up to 6′ high.

E. pusilla *R. Br.* 1317, Mannus Creek, Tumbarumba, 28.12.1947; 3282, Bulgandry Reserve, Bulgandry, plentiful, mostly mature, 6.5.1949; 1070, 1197, 1251, 1253, Holbrook, forming fine green turf in moist paddocks, 18.12.1946, 2.11.1947, 6.12.1947; 4238, Cemetery Reserve, Henty, abundant on margins of swamp, 9.12.1949 (abundant flowering at this site, after recent rains on 24.2.1950); 1162, Eyre's Canal, Corowa Road, Howlong, nearly totally submerged, 16.10.1947; 1433, 1678, Cumberoona Reserve, Bowna, as soft, green, matted patches, 26.2.1948, 18.4.1948; 1447, Bethanga Bridge, Albury, soft mats in sand, 1.3.1948; 3207, Mungabarina Reserve, Albury, plentiful along sandy creek bank, 3.4.1949. Recorded for Walwa, 27.12.1947 and Bandiana, 21.2.1948 in N.E. Victoria. Fl. Oct.-March, mainly in spring and after summer rains.

A common species in the area, forming characteristic soft green mats by virtue of its rhizome. A common habitat is around the sandy margins of lagoons or roadside seepages, where it produces a soft turf several feet wide. Careful search underneath taller herbage in marshes will reveal it in numerous localities.

E. atricha R. Br. 1318, 2888, Munderoo Creek, Mannus, in morass, about 2,200′, 28.12.1947, 28.12.1948; 548, 554, 2-Mile Reserve, Holbrook, in swamp, 1.3.1947, 12.2.1947; 4523, Wymah Gap, 25 miles E. of Albury, large patches situated on soakage, 28.2.1950; 3133, 3190, 3310, Bake's Reserve, Gerogery, about 700′, in peaty clay of swamp adjoining stock dam, 1.3.1949, 25.3.1949, 16.5.1949; 5405, Mullengandra, abundant both in hillside soakages and swampy depressions in gullies; highest proportion of fl. material in spongy, moist turf, 13.12.1950. Recorded, No. 4671, Beechworth (N.E. Vic.) township, roadside seepage, occasional fl. 25.6.1950. Fl. Dec.-May, probably longer in sheltered spots.

Plentiful at localities cited, and mostly rooted in mud. A curious species, as indicated by Blake in his monograph in Proc. Roy. Soc. Queensland, *L* (1939), 108, since none of the above material has fruits. Very sensitive to dehydration, causing the yellow-green culms to curve and bury the tips in the mud. As such, it forms a characteristic series of half-hoops, often over several yards diameter, with very little flowering material.

E. gracilis *R. Br.* 1118, 1288, 1260, The Glen, Tumbarumba, plentiful in swamps, 5.10.1947, 26.12.1947, 6.12.1947; 1168, 2-Mile Reserve, Holbrook, swamp plant in mud, 11.10.1947; 2659, Lehmann's Reserve, Walla Walla, in mud of overflow from stock tank, plentiful, 24.11.1948. Fl. Oct.-Jan.

Common in many parts of the Tumbarumba district, sparingly distributed over the remainder of the area.

E. acuta *R. Br.* 808, 834, 1319, The Glen, Tumbarumba, about 2,200′, in swamps, 5.4.1947, 7.4.1947, 26.12.1947; 559, "Sour Flat" Reserve, Little Billabong, 24.2.1947; abundant fl. material in Albury and Jindera districts on 2.10.1950; 4364, Grubben, N. of Henty, mature material along creek bank, 6.1.1950; 3283, Bulgandry Reserve, Bulgandry, plentiful, but fl. material scarce, 6.5.1949; 2767, Cumberoona Reserve, Bowna, fairly common in shallow roadside pools, 7.12.1948; 1409, Gerogery Road, Culcairn, 12.2.1948; 356, 737, 1094, Holbrook and environs, in swampy land, 15.12.1946, 15.3.1947, 28.9.1947. Fl. Sept.-May, mostly in spring and again in summer and autumn after rain.

Widespread and common throughout the area, most noticeable on roadsides during early spring. After summer rains, it throws up abundant flowering stalks with amazing rapidity.

E. pallens *S. T. Blake.* 4474, Lockhart Road, 3 miles N.W. of Rand, clump in roadside ditch, mostly mature, 9.2.1950; 5971, Mahonga, 8 miles N.W. of Rand, dense clumps in mud of roadside claypans, 16.11.1952.

Fimbristylis *Vahl.*

F. aestivalis (*Retz.*) *Vahl.* 1418, Howlong Common, common, 23.2.1948; 1819, Murray River, Howlong, 13.5.1948; 1667, Mungabarina Reserve, Albury, 1.4.1948. Recorded also 1429, Wodonga (Vic.) on moist banks of lagoons, 21.2.1948; 3172, Kiewa River flats, Bandiana (Vic.) as plentiful on margins of lagoons and creeks, 20.3.1949. Fl. Feb.-April, rarely as late as May.

Observed only along the Murray River and flats, where it is plentiful in the lowest herb stratum, generally associated with *Lipocarpha microcephala.*

Schoenus *L.*

S. apogon *Roem. et Schult.* 2865, Munderoo Creek, Mannus, about 2,200′, mature, 28.12.1948; 360, 2845, The Glen, Tumbarumba, common sedge of moist pastures, 25.12.1946, 26.12.1948; 372, Lankey's Creek, 23.12.1946; 1034, Wantagong, common sedge in swamp, 6.1.1947; 558, 2-Mile Reserve, Holbrook, 12.2.1947; 361, Woomargama, common sedge, 12.12.1946; 1174, Ournie, roadsides, early fl. 4.10.1947;

2115, Gerogery Common, in hard clay pan of drain, 29.9.1948; 2465, 9-Mile Hill, Albury, on gravel pit, affected by smut, 1.11.1948. Recorded 2925, Stanley Rd., Beechworth (N.E. Vic.), about 2,000′, 3.1.1949. Flowering and fruiting material from October to March, and later at higher elevations. Widespread and common. Almost everywhere in swamps and marshy areas.

S. lateiaminatus *Kuekenth.* 1250, Holbrook, under tall herbage in marshy paddock, about ½ mile south of township, 6.12.1947; 5602, Bake's Reserve, Gerogery, clumps in swamp, fl. 12.10.1951; 5401, Gerogery Road, Jindera, under dense marsh herbage in semi-permanent swamp off roadside, 28.11.1950; 5390, Cemetery Reserve, Henty, diffuse but not common under tall herbage, mainly *Amphibromus neesii, Eleocharis atricha* and *Goodenia gracilis* in marshy area adjacent to stock dam, 24.11.1950. Recorded by Maiden and Betche (1903, p. 922-923) as "*S. sculptus* Boeck", collected near Germanton (now Holbrook) by W. Forsyth, 11.1900 (determination checked by N.S.W. Nat. Herb. 12.1949). Fl. Oct.-Dec. At least distributed over the South-West slopes region of the area at lower elevations.

S. maschalinus *Roem. et Schult.* 5427, Munderoo West Creek, Wolseley Park, along and under shaded, moist creek banks, 2,200′-2,500′, 27.12.1950.

Lepidosperma *Labill.*

L. laterale *R. Br.* 357, 800, Tunnel Rd., Woomargama, 20.12.1946, 10.4.1947; 1768, 1769, Trig. Station Hill, West Albury, common species near summit, (about 1,000′), amongst granite outcrops, 14.6.1948. Fl. and fr. material is available for most periods of the year. Widespread and common, preferring rough, rocky forest country of low fertility.

Cladium *P. Br.*

C. glomeratum *R. Br.* 709, 1290, The Glen, Tumbarumba, in clumps to 5′ high in swamps, 11.3.1947, 26.12.1947; 1073, Carboona Gap, Tumbarumba, to 2′ high in clumps over several sq. yards, 27.1.1947; 1166, 2-Mile Reserve, Holbrook, dense growth in swamps, 11.10.1947. Fl. Oct.-March and later at higher elevations.

Plentiful at localities cited and invariably rooted in mud, preferring permanent swamps and soakages.

C. gunnii *Hook. f.* 1324, 2899, Murray's Crossing, Tumbarumba, extensive clumps in moist sandy creek bank, 2.1.1948, 27.12.1948. Not observed elsewhere.

C. teretifolium *R. Br.* var. **asperrimum** *Kuekenth.* Recorded Nos. 4672, 4675, Beechworth (N.E. Vic.) township, 25.6.1950.

Carex *L.*

C. chlorantha *R. Br.* 1325, Murray's Crossing, Tumbarumba, partially submerged, 2.1.1948; 5175, Munderoo West, near Tumbarumba, common in swamps, 24.10.1950; 5228, Adelong Road, 6 miles N. of Tumbarumba, abundant in swampy depressions along watercourses, 26.10.1950; 1142, Lankey's Creek, sedge along moist, shaded, sandy creek bank, 18.10.1947; 1068, Murray River, Tintaldra, 27.12.1946. Fl. Oct.-Jan.

Not a common sedge though widespread, occurring in scattered clumps in shaded areas, less commonly in exposed marshy areas.

C. tereticaulis *F. Muell.* 3215, Howlong Common, on Murray River flats, 1.4.1949; 3713, Horse Shoe Lagoon, Albury, occasional fl. and early fr. 7.10.1949. Clumps occur along watercourses in the Burrumbuttock district, mostly fr. on 13.3.1950, also occasional plants in road drains at Wymah Gap. Fl. spring and summer.

Widespread but not common at elevations over 1,000′ and often inconspicuous amongst the common *C. appressa* from which it is distinguished by the more rigid and cylindrical stems and shorter leaves.

C. appressa *R. Br.* 375, Culcairn Rd., Holbrook, 21.12.1946; 1133, Garry Owen Reserve, Holbrook, 10.10.1947; 1029, Cookardinia, 6.1.1947; 376, Hume Highway, Woomargama, 20.12.1946; 2954, 9-Mile Hill, Albury, 9.1.1949. Fl. spring and summer.

Widespread and common, forming clumps along watercourses, roadsides, culverts and in marshy paddocks. Of low palatability, it is rarely grazed by stock, who, at the most, nibble the tops of the tussocks. This explains its dominance in many areas. It is of value in preventing erosion of the banks of many creeks and on roadsides, but this is countered by its affording harbour to rabbits and hampering the control of these pests.

C. inversa *R. Br.* and forms. 704, 833, 835, The Glen, Tumbarumba, common sedge in swamps and pastures, 11.3.1947, 4.4.1947, 7.4.1947; 368, Tumbarumba, common swamp plant, 23.12.1946; 369, 736, 790, Holbrook and environs, plentiful in pastures and roadsides, 13.12.1946, 15.3.1947, 4.4.1947; 1027, Cookardinia, 6.1.1947; 1436, Burrumbuttock, 25.2.1948; 2607, Albury, garden weed, 17.11.1948; 3671, Mungabarina Reserve, Albury, abundant fl. 1.10.1949. Observed fl. at Bulgandry, 14.10.1949 and 4550, Henty, grassland, 3.3.1950. Fl. Oct.-April.

Very widespread and common throughout the area and of no specific habitat. A variable species as regards field appearance; often dwarfed and atypical forms occur in heavily grazed paddocks or arid gravelly sites.

C. gaudichaudiana *Kunth.* 367, Tumbarumba, 23.12.1946; 804, 5147, The Glen, Tumbarumba, 5.4.1947, 24.10.1950; 549, Munderoo Creek, Tumbarumba, 12.2.1947; 366, Carboona Gap, Tumbarumba, plentiful on roadsides, 23.12.1946; 1156, Lankey's Creek, 18.10.1947; 1026, Murray River, Jingellic, 27.12.1946; 1030, Coppabella Creek, Jingellic, 27.1.1947. Fl. Oct.-Jan.

Very common and widespread in the Tumbarumba district, reaching maximum development over 1,000′, often forming pure stands in beds of watercourses and easily mistaken for a grass turf. Scattered along the Murray River; elsewhere uncommon.

C. polyantha *F. Muell.* Recorded at Bringenbrong Bridge by Williamson (1929, p. 263) but "by no means common".

C. breviculmis *R. Br.* 2840, The Glen, Tumbarumba, about 2,300′, not common in shady forest, 26.12.1948; 2038, 2107, 2700, Monument Hill, Albury, 18.9.1948, 27.9.1948, 28.11.1948. Recorded No. 2722, Indigo Falls, Leneva and ascending to Mt. Stanley in N.E. Vic. Fl. spring and summer.

Widespread but not common; observed only in forest and woodlands and there of diffuse distribution.

C. fascicularis *Soland. ex Boott.* 2830, The Glen, Tumbarumba, about 2,500′, scattered in clumps along watercourses, 26.12.1948; 1311, Carboona Gap, Tumbarumba, plentiful along watercourses, 26.12.1947; 3238, Woomargama, in muddy creek bed, end of fr. 9.4.1949. Recorded 2938, Yackandandah (Vic.) in clumps along creeks, about 1,500′, 3.1.1949. Fl. Nov.-Jan.

Common in swamps and in beds of creeks at elevations over 1,000′, rare if not absent from the slopes and wheat areas. Prefers permanent marshy areas, forming dense stands.

C. bichenoviana *Boott.* 1067, 10-Mile Creek, Holbrook, uncommon on sandy creek bank, 14.12.1946; 2962, 2963, Billabong Creek, Rand, diffuse patches in grey sandy loam banks, 10.1.1949.

Has only been observed as scattered patches along the course of the Billabong Creek from Holbrook to Rand.

PALMAE

Washingtonia *H. Wendl.*

† **W. robusta** *H. Wendl.* Cultivated in Albury Botanic Gardens and in several homesteads in the district.

Phoenix *L.*

† **P. dactylifera** *L.* "Date Palm". Commonly cultivated.

ARACEAE

Zantedeschia *Spreng.*

† **Z. aethiopica** (*L.*) *Spreng.* "Arum Lily". Commonly cultivated in Albury gardens and elsewhere but not observed to have become naturalised.

LEMNACEAE

Lemna *L.*

L. oligorrhiza *Kurz.* 1269, Woomargama, on garden pond, 24.12.1947. Widespread and plentiful on lagoons and streams in the Albury district during spring and summer.

L. polyrhiza *L.* Collected by Mueller on "lagoons on the Towong", 1874, fide Williamson (1928, p. 244). The same author (1929, p. 261) records in lagoons of Murray River, near Biggara, "*Wolffia arrhiza* (L.) Wimm., and two species of duckweed, *Spirodela oligorrhiza* (Kurz) Hegelm., and *S. polyrrhiza* (L.) Schleid." Two species are known to occur with certainty within the area but specific collections have not been made.

CENTROLEPIDACEAE

Trithuria *Hook. f.*

T. submersa *Hook. f.* 1252, Holbrook, reddish swamp plant, 6.12.1947; 5403, Jindera Road, Gerogery, reddish overall, inconspicuous on account of associated growth of *Eleocharis pusilla* and smaller *Scirpus* spp., under tall, marsh herbage, rooted in mud, fl. 28.11.1950; 5544, Wallandool Reserve near Urangeline, in mud of clay pans with *Myriophyllum propinquum, Eleocharis acuta* and *Brachycome muelleroides,* 18.9.1951; 5688, Cemetery Reserve, Henty, margin of swampy site, 9.11.1951. Fl. Sept.-Dec.

Widespread at lower elevations, in swamps or moist spots not subject to rapid dehydration.

Aphelia *R. Br.*

A. gracilis *Sond.* 1196, 1259, Holbrook, plentiful in moist depressions of grassland, 2.11.1947, 6.12.1947; 5396, Gerogery Road, Jindera, in mud of roadside swamp, hidden by tall marsh herbage, occurring in erect clumps, 28.11.1950; 5605, Thurgoona, muddy pool off roadside, early fl. 16.10.1951. Fl. Oct.-Dec.

Widespread at lower elevations and confined to moist sites in company with a predominantly sedge flora. Easily confused with or masked by the common *Cyperus tenellus,* with which it often grows.

Centrolepis *Labill.*

C. strigosa (*R. Br.*) *Roem. et Schult.* 5355, Tunnel Road, Woomargama, uncommon in moist spots in depths of shallow gully, 18.11.1950; 5044, Monument Hill, Albury, around shallow pool formed by old gravel excavations in a shaded position in scrub land, 8—15.10.1950; 5708, 2 miles S.E. of Balldale, margins of shallow roadside pool, 19.11.1951.

Widespread at least at lower elevations.

C. polygyna (*R. Br.*) *Hieron.* 5707, 2 miles S.E. of Balldale, sandy soil at edge of rapidly-drying roadside pool, 19.11.1951.

C. glabra *Hieron.* 5937, Gerogery Road, Jindera, under marsh herbage in swampy roadside depression, mixed with *Trithuria submersa, Aphelia gracilis* and *Cyperus tenellus* in wet clay mud, common, 7.11.1952.

PONTEDERIACEAE

Pontederia *L.*

† **P. cordata** *L.* var. **lancifolia** *Muhl. ex Morong.* 309, Woomargama, well established in ornamental lake, 16.1.1947. Uncommon.

ERIOCAULACEAE

Eriocaulon *L.*

E. scariosum *Sm.* 604, 1263, 1326, The Glen, Tumbarumba, plentiful in swamps, invariably in mud, 24.2.1947, 5.12.1947, 3.1.1948; 547, 634, 2-Mile Reserve, Holbrook, swamp plant, 1.3.1947, 12.2.1947; 5514, Bake's Reserve, Gerogery, abundant in dried-up swamp with *Eleocharis atricha,* mature material only, 15.4.1951. Recorded, 4668, Beechworth (N.E. Vic.), roadsides, fl. 25.6.1950. Fl. Dec.-Feb., later in sheltered moist sites.

Plentiful at localities cited but often localised. Invariably in very moist sites, rooted in mud of permanent or semi-permanent soakages. Habitat similar to that of *Pycreus sanguinolentus, Kyllinga brevifolia* and *Eleocharis atricha* and contemporaneous with those species.

COMMELINACEAE

Tradescantia *L.*

* **T. albiflora** *Kunth.* 4342, Holbrook, garden weed, fl. 28.12.1949. Commonly cultivated and spontaneous in Albury gardens. Occasional in gardens in various towns of the area.

JUNCACEAE

Juncus *L.*

* **J. capitatus** *Weig.* 3262, Munderoo Creek, Mannus, uncommon under moist sheltered creek bank, 2,200′-2,500′, 24.4.1949; 2121, 4013, 4309, The Glen, Tumbarumba, patchy distribution in open forest lands, 3.10.1948, 9.11.1949, 27.12.1949; 1088, Holbrook, in moist clay of roadside, 28.9.1947; 1181, Holbrook, Government Tank, 26.10.1947; 4197, Ryan, near Henty, fairly common in dried clay pans, 3.12.1949; 3616, P.W.P. Tank, Burrumbuttock, fairly common on moist clay margins, 23.9.1949; 2466, 9-Mile Hill, Albury, plentiful in gravel pit, 1.11.1948; 2036, 2625, Monument Hill, Albury, in damp, open paddock, amongst short herbage, 18.9.1948, 21.11.1948. Fruiting material observed, sheltered by sedge flora at Wymah Gap on 28.2.1950. Fl. Aug.-Feb., later at higher elevations.

Very widespread throughout the area, with no specific habitat. Easily observed in pasture lands during early spring, but soon overtaken by the growth of taller herbage.

J. bufonius *L.,* and forms. 326, 702, 703, The Glen, Tumbarumba, plentiful in swamps, pastures and roadsides, 1.1.1947, 11.3.1947; 325, 327, 713, Holbrook and environs, 16.12.1946, 18.12.1946, 9.3.1947; 3391, Lehmann's Reserve, Walla Walla, mainly fl. 22.7.1949; 2624, Monument Hill, Albury, low herb, 21.11.1948. Observed to be approaching fl. in mid-September, 1949, in Albury district and to be flowering abundantly at Wymah Gap on 28.2.1950. Fl. Sept.-March, to lesser degree to July. Widespread and common.

* **J. tenuis** *Willd.* 2892, 2897, Murray's Crossing, Tumbarumba, 2,200′, fairly plentiful in swampy land, 27.12.1948; 725, Murray River, Tintaldra, in shady grassed locality, 17.3.1947.

Common at localities cited; distribution and incidence unknown.

J. homalocaulis *F. Muell. ex Benth.* 4361, Grubben Reserve, N. of Henty, depression in grassland, mature, 6.1.1950; 320, Woomargama, in creek, 13.12.1946; 569, Billabong Creek, Holbrook, 30.1.1947; 1185, Table Top, 21.10.1947; 2682, Albury Trucking Yards, on margin of waterhole, 27.11.1948; 2799, Albury, garden, 19.12.1948; 2721, recorded for Indigo Falls, Leneva (Vic.), in shaded pasture, 4.12.1948. Fl. Nov.-Jan. Widespread and common, at least at lower elevations.

† **J. acutus** *L.* 5502, Moorwatha, near Howlong, occasional clumps on roadside sandy loam, fr. 5.4.1951. Recorded 1694, Chiltern (N.E. Vic.), 2 miles N. of town on sedimentary formation of *Eucalyptus sideroxylon* country, 26.4.1948.

Observed to be quite plentiful along the Murray Valley Highway from Wodonga to Rutherglen in the corresponding part of N.E. Victoria and also occurs between Gundagai and Jugiong on the Hume Highway in N.S.W., but only the single locality known within the area.

J. filicaulis *Buchen.* 813, The Glen, Tumbarumba, slender rush in ploughed ground, 4.4.1947.

J. vaginatus *R. Br.* 4522, 4528, 4537, Wymah Gap, clumps on roadside, 28.2.1950; 5775, Lehmann's Reserve, Walla Walla, clumps around swampy depressions in open grassland, 30.11.1951.

J. polyanthemus *Buchen.* or sp. aff. 4506, Cumberoona Reserve, Bowna, clumps along creek banks, 28.2.1950. Other collections appear to fall within the ambit of this species.

J. radula *Buchen.* 5634, Comer Reserve, 6 miles S.W. of Henty, rooted in clay depression of grassland, 25.10.1951; 5645, 4 miles N. of Gerogery, along railway line, 28.10.1951.

J. procerus *E.Mey.* 5833, Bulgandry Reserve, Bulgandry, plentiful over bed of swamp, 14.1.1951.

J. prismatocarpus *R. Br.* 705, 4296, 4298, The Glen, Tumbarumba, common rush in swamps, 11.3.1947, 26.12.1949; 3264, Munderoo Creek, Mannus, plentiful along creek banks, 24.4.1949; 2874, Tumbarumba Road, Laurel Hill, on margin of morass, 27.12.1948; 319, 2-Mile Reserve, Holbrook, in marsh, 16.12.1946. Fl. Dec.-Feb.

Widely spread and common in most swamps. Forms a dense matted stand in mud or soakages. Relatively unpalatable to stock who barely graze the tops in the absence of better feed.

J. fockei *Buchen.* 3042 (in part), Bake's Reserve, Gerogery, in swamp, 26.1.1949.

* **J. articulatus** *L.* 5424, Munderoo West Creek, Wolseley Park, diffuse and intermatted with *Hydrocotyle* spp. and *Scirpus crassiusculus* in moist sand along banks and in creek beds, 27.12.1950; 5443, Paddy's River, Tooma, moist shaded spots along and under banks, 26.12.1950; 4515, Wymah Gap, in swamp, 28.2.1950; 317-8, Holbrook, common swamp plant, 10.12.1946; 12.12.1946; 3042 (in part), Bake's Reserve, Gerogery, in swamp, 26.1.1949; 4592, Mullengandra, clumps along creek banks, 11.3.1950. Fl. Oct.-March.

Well established throughout the area. The distinct transverse septa of the leaves on drying is a field characteristic though not so prominent in the fresh state.

J. planifolius *R. Br.* 316, 715, 794, Holbrook and environs, in swamps, 8.12.1946, 9.3.1947, 4.4.1947; 315, Woomargama, swamp plant, 12.12.1946; 3392, Lehmann's Reserve, Walla Walla, mature material only, 22.7.1949. Fl. summer.

Plentiful at localities cited, but observed at few other places.

J. spp. Several other collections have been made in the group "genuini" but it has not yet been possible to determine the identity of these.

Luzula *DC.*

L. campestris (*L.*) *DC.* sens. lat. 2810, Blue Hill, Munderoo State Forest, Tumbarumba, 26.12.1948; 1119, The Glen, Tumbarumba, common in moist forest, 5.10.1947; 1150, Carboona Gap, Tumbarumba, roadsides, 18.10.1947; 4517, Wymah Gap, Wymah, occasional in swamps, mostly young growth, 28.2.1950; 1947, 3416, Monument Hill, Albury, common in open forest land, 4.9.1948, 7.8.1949. Fl. Aug.-Feb.

Very widespread, especially in forest lands.

LILIACEAE

Burchardia *R. Br.*

B. umbellata *R. Br.* 5193, Tumbarumba, Railway Reserve, common in scrub land, fl. 26.10.1950; 5073, Gerogery, very common in railway enclosure, fl. 13.10.1950; 1189, Table Top, on railway embankment, 21.10.1947; 2520, Albury, railway line, 7.11.1948; 3768, Monument Hill, Albury, full fl. 12.10.1949. Observed in open forest country at Woomargama, fl. 11.1948; Jindera Common, fl. 3.10.1950. Fl. Sept.-Nov.

Still a common species, present along miles of railway lines in scrub or forest lands or sheltered, ungrazed areas.

Anguillaria *R. Br.*

A. dioica *R. Br.* 1080, Tumbarumba, in pasture, 13.9.1947; 1145, Lankey's Creek, plentiful, mostly fr. 18.10.1947; 3442, Pleasant Hills, abundant in barer ground of paddocks, 15.8.1949; 4738, Henty, in grassland, fl. 4.8.1950; 4774, Bulgandry, fl. 21.8.1950; 4850, Alma Park, in grassland, 23.9.1950; 1940, Monument Hill, Albury, very common, fl. and fr., 4.9.1948. Occasional flowering material observed at Batlow, Laurel Hill and Paddy's River districts on 8.11.1949. Fl. July-Nov.

Very widespread and common in Spring pastures with no specific habitat. Fruiting material persists into summer.

Bulbine *L.*

B. bulbosa (*R. Br.*) *Haw.* 5195, Railway Reserve, Tumbarumba, scrub land, 26.10.1950; 1116, Jingellic, on moist road banks, 4.10.1947; 4901, 5 miles N. of Henty, grassland, fl. 22.9.1950; 4849, Alma Park, common on roadsides, fl. and early fr. 23.9.1950; 4934, Balldale, roadsides, fl. and fr. 25.9.1950; 1138, Table Top, 9.10.1947; 3745, Monument Hill, Albury, fairly common, 12.10.1949. Fl. Sept.-Nov.

Widely spread and common in scrub and railway lands, roadsides and cemetries; occasional in freely-grazed spring pastures.

Thysanotus *R. Br.*

T. tuberosus *R. Br.* 2819, Blue Hill, Munderoo State Forest, Tumbarumba, in forest land, 26.12.1948. Not observed elsewhere.

T. patersonii *R. Br.* 3958, The Glen, Tumbarumba, occasional in forest land, 7.11.1949; 4936, 6 miles N. of Balldale, roadsides, fl. 25.9.1950; 3812, Nail Can Hill, West Albury, occasional, 17.10.1949; 2033, 3755, Monument Hill, Albury, in scrub land, 18.9.1948, 12.10.1949. Observed in *Callitris glauca* woodland at Bulgandry, fl. 15.10.1951. Fl. Sept.-Nov.

Now restricted to more protected sites as indicated. An inconspicuous species, especially amongst fallen leaves and herbage, only discernible on account of its flowers.

Dichopogon *Kunth*

D. strictus (*R. Br.*) *Bak.* 5160, Yarrara Gap, Wantagong, roadsides, fl. 23.10.1950; 3707, 3723, Culcairn, railway line, 3.10.1949, 11.10.1949; 1190, Table Top, in waste land, 21.10.1947; 5094, Jindera, grassland, fl. 10.10.1950. Observed in parts of the Holbrook district.

Widely spread at lower elevations and frequent.

D. fimbriatus (*R. Br.*) *Macbride.* 1208, Holbrook, in paddock, 2,11,1947; 4194, 4198, Ryan, near Henty, common in grassland, 3.12.1949; 4940, 6 miles N. of Balldale, grassland, early fl. 25.9.1950; 4191, 4218, Walla Walla, stock reserve, 30.11.1949; 4496, 5 miles E. of Henty, occasional flowers on old plants after recent rains, 24.2.1950; 2645, Monument Hill, Albury, plentiful, 21.11.1948. Recorded by Hurst (1942) as poisoning stock at Holbrook in 1920. **Fl. Sept.-February.**

Widespread and common, at least under 1,000′.

Arthropodium *R. Br.*

A. minus *R. Br.* 3963, The Glen, Tumbarumba, damp spots in grassland, fl. 7.11.1949; 5404, Mullengandra, uncommon in swampy depressions in gully, fl. 13.12.1950; 3825, Bulgandry, 17.10.1949; 4946 (in part), Goombargana, grassland, 25.9.1950; 5032 Walbundrie, between rocks of granitic outcrops, early fl. 4.10.1950; 4937, 6 miles N. of Balldale, here and there amongst roadside herbage, fl. 25.9.1950; 2536, Jindera Gap, in pasture, 9.11.1948; 1194, 14-Mile Reserve, Howlong Road, Albury, 21.10.1947. Fl. Oct.-Dec.

Widespread and common, mostly in grasslands.

A. milleflorum (*Red.*) *Macbride.* 2816, Blue Hill, Munderoo State Forest, Tumbarumba, 2500′-2800′, 26.12.1948; 4322, Munderoo Creek, Mannus, common in spots of marshy area, 27.12.1949; 4946 (in part), Goombargana Stock Reserve, grassland, fl. and early fr. 25.9.1950. Fl. Sept.-Dec.

Widespread as indicated by these localities; incidence unknown.

Tricoryne *R. Br.*

T. elatior *R. Br.* 4505 East Henty, roadsides, 24.2.1950; 143, Mountain Creek, Holbrook, along roads and creek banks, 18.12.1946; 2759, Monument Hill, Albury, 5.12.1948, occasional flowering plants at this site on 16.4.1950. Flowering after recent rains at Thurgoona on 20.2.1950. Fl. Dec.-April.

Widespread and common in pastures, forest lands, but reaching maximum development on railway embankments, reserves and parklands. A hardy species, often occurring as clumps on the headlands of old cultivation paddocks. Its low palatability and hardiness are of assistance in maintaining it on heavily grazed lands.

Caesia *R. Br.*

C. vittata *R. Br.* 2730, Monument Hall, Albury, 5.12.1948.

Stypandra *R. Br.*

S. glauca *R. Br.* 2008, 2497, 4981 Tunnel Road, Woomargama, on sedimentary formations, plentiful, 13.9.1948, 6.11.1948, 2.10.1950; 4519, 4805, Wymah Gap, large patches on dry hillside, end of fr. 28.2.1950, early fl. 27.8.1950. Of scattered distribution along the Great Southern Railway Line from Henty to Albury; plentiful on rocky hills around Holbrook, mostly in company with *Isotoma axillaris;* occurs in large clumps on shallow soil over rocks on hillsides in many parts of the Upper Murray Valley. Recorded for Mt. Mittamatite, near Corryong (Vic.) by Williamson (1929, p. 260), end of flowering on Nov. 9th. Fl. spring and early summer.

Dianella *Lam.*

D. laevis *R. Br.* 4563, railway line 4 miles N. of Henty, fl. 6.3.1950; 1441, Albury, 7.2.1948; 2646, Monument Hill, Albury, 22.11.1948. Fl. Nov.-March.

D. revoluta *R. Br.* 5336, Tumbarumba, railway reserve, scrub land, fl. 11.11.1950; 158, Holbrook Cemetery, 18.12.1946; 3899, Burrumbuttock, fairly common in open forest, early fl. 28.10.1949. Fl. mostly in spring, the berries persisting into summer.

Both species of *Dianella* appear to be widely spread and common in scrub lands, cemeteries, railway lines and little-grazed lands. The relative proportion of each species is not known, but both occur at the same localities.

Muscari *Mill.*

* **M. neglectum** *Guss.* "Grape Hyacinth". 1983, Western Hill, Albury, making free growth in garden, 4.9.1948; observed early fl. 26.8.1949; full fl. 19.9.1949; mostly fr. 2.10.1949; end of fl. 22.10.1949. Observed to be naturalised on Monument Hill, Albury, on site of discarded wreaths and bouquets and on railway embankment at Table Top. End of fr., Holbrook garden on 6.11.1949. Fl. Aug.-Oct.

Commonly cultivated, sparingly naturalised in some parts.

Asparagus *L.*

* **A. officinalis** *L.* "Asparagus". 334, Woomargama, naturalised in garden, 16.1.1947. Spontaneous in several Albury gardens. Fl. spring, the fruits persisting in summer.

† **A. plumosus** *Bak.* 780, Tumbarumba, cultivated, 6.4.1947. Observed in Howlong and Albury Gardens and commonly cultivated. Exhibited as "a new plant" at Albury Show, September, 1886. (*Border Post* 18.9.1886.)

† **A. sprengeri** *Regel.* 1388, Albury, cultivated, 1.12.1948. Commonly cultivated.

Myrsiphyllum *Willd.*

* **M. asparagoides** (*L.*) *Willd.* 3612, P.W.P. Tank, Burrumbuttock, uncommon, fl. 23.9.1949; 3900, Albury garden, fr. 31.10.1949. Spontaneous at site of 3612. Uncommon.

Liriope *Lour.*

† **L. spicata** *Lour.* 837, Tumbarumba, garden, 5.4.1947. Commonly cultivated.

Aloe *L.*

† **A. ciliaris** *Haw.* 4674, Henty, garden plant, 21.6.1950.

Polygonatum *Adans.*

† **P. multiflorum** (*L.*) *All.* "Solomon's Seal". 3758, Albury garden, 12.10.1949. Commonly cultivated.

Convallaria *L.*

† **C. majalis** *L.* "Lily-of-the-Valley". Commonly cultivated in Albury gardens.

Asphodelus *L.*

* **A. fistulosus** *L.* "Onion Weew." 4884, Henty, single plant in railway enclosure. fl. and fr. 22.9.1950.

Scilla *L.*

* **S. hyacinthoides** *L.* 5666, railway enclosure, 1 mile S. of Gerogery, spreading in waste land, fl. 31.10.1951.

Ornithogalum *L.*

* **O. tenuifolium** *Guss.* 4960, Gerogery West, occasional clumps in garden tending to spread, fl. 4.10.1950; 5562, Burrumbuttock, patch of ½ acre in swampy grassland paddock, fl. 4.10.1951.

RUSCACEAE.

Ruscus *L.*

† **R. aculeatus** *L.* "Butcher's Broom". 3931, Albury Botanic Gardens, cultivated, 2.11.1949.

XANTHORRHOEACEAE

Lomandra *Labill.*

L. longifolia *Labill.* 5334, Tumbarumba, railway reserve, scrub land, 11.11.1950; 332, Carboona Gap, Tumbarumba, on stony bank, 16.12.1946. Observed on hillsides at Tooma.

L. multiflora (*R. Br.*) *J. Britten.* 333, Tunnel Road, Woomargama, in open forest, 18.12.1946; 1046, Woomargama, 8.1.1947; 3944, Burrumbuttock, in open forest land, fl. 28.10.1949; 4852, Balldale, roadsides, 24.9.1950; 5079, Ryan, near Henty, grassland, fl. 13.10.1950; 1939, 1946, 2032, Monument Hill, Albury, common, 4.9.1948, 18.9.1948. In bud only at Carboona Gap, Tumbarumba, 8.11.1949.

Widespread and frequent.

L. filiformis (*Thunb.*) *J. Britten* sens. lat. 4023, The Glen, Tumbarumba, open forest, fl. 10.11.1949; 1201, 1207, Holbrook, 2.11.1947; 1146, Lankey's Creek, on rocky banks, 18.10.1947; 2495, Tunnel Road, Woomargama, common on roadsides, 6.11.1948; 3863, Brocklesby Road, Burrumbuttock, fairly common, fl. 26.10.1949; 3767, Monument Hill, Albury, scrub land, fl. 12.10.1949; 3811, Nail Can Hill, Albury, open forest, fl. 17.10.1949.

Widespread and common in most woodlands and forests in the area.

Xanthorrhoea *Sm.*

X. australis *R. Br.* "Grass tree". 3991, Carboona Gap, Tumbarumba, fairly common on hillsides, 6.11.1949; 5415, Tunnel Road, Woomargama, scattered over rugged hills, 2.10.1950. Plentiful on hilly country at Tooma and noted there by Luke Gulson travelling from Welaregang where "the road winds between two bald hills called 'The Sisters'. Their steep sides are covered with grass trees." Williamson (1929, p. 260) records tall specimens to 12′ at Mt. Mittamatite (Vic.).

AMARYLLIDACEAE

Nothoscordum *Kunth*

* **N. fragrans** (*Vent.*) *Kunth.* "Wild Onion". 2590, Table Top, troublesome weed in garden, 10.11.1948. Present in the Albury Botanic Gardens; observed mainly fr. in Henty garden, 20.11.1951 As yet localised throughout the western half of the area.

Allium *L.*

* **A. triquetrum** *L.* 3834, Albury Botanic Gardens, occasional plants at edge of greenhouse, 19.10.1949; 5550, Burrumbuttock, patch in garden, spreading, fl. 20.9.1951. Noted only at these localities.

* **A. neapolitanum** *Cyr.* 5557, Henty, spreading in waste lands of railway enclosure and cemetery, fl. 28.9.1951.

Agapanthus *L.*

† **A. africanus** (*L.*) *Hoffmgg.* 1059, Woomargama, 16.1.1947. Commonly cultivated.

HYPOXIDACEAE

Hypoxis *L.*

H. hygrometrica *Labill.* 470, 783, The Glen, Tumbarumba, moist pastures and in swamps, 25.12.1946, 4.4.1947; 4602, Fagan's Reserve, 3 miles N. of Walbundrie, dense patches in swamp, mostly fr. 20.3.1950; 4502, Cemetery Reserve, Henty, growth after recent rains, clay loam, fl. 24.2.1950. Small amount of early flowering material observed at Walla Walla on 5.8.1949; 4816 (in part), Monument Hill, Albury, scrub land, fl. 11.9.1950; isolated plants in flower on Monument Hill, Albury on 7.8.1949. Fl. Aug.-April, largely depending on seasonal conditions.

Widespread and common in damp grasslands, swamps and moist forests throughout the area, occurring in dense swards.

H. glabella *R. Br.* 4762, Wallandool, near Henty, grassland, 15.8.1950; 4760, Bulgandry Reserve, Bulgandry, common in grassland, 15.8.1950; 4988 (in part), Talmalmo, in scrub land, fl. and early fr. 2.10.1950; 4790, Balldale, diffuse in roadside herbage, fl. 25.8.1950; 4758, 9-Mile Hill, Albury, common in swampy grassland, 15.8.1950; 1963, 4825 (in part), Nail Can Hill, West Albury, open pasture, 5.9.1948, fl. and early fr. 11.9.1950; 4816 (in part), Monument Hill, Albury, scrub land, fl. 11.9.1950. Fl. Aug.-Oct.

Widespread in grasslands, forests and scrublands, often mixed with its congeners cited.

H. pusilla *Hook. f.* 4988 (in part), Talmalmo, in scrubland, 2.10.1950; 3470, Rand, uncommon in pasture, 22.8.1949; 3508, Oil Tree Lagoon, Balldale, patches in sandy soil, 1.9.1949; 3522, 3534, Comer Reserve, 6 miles S.W. of Henty, grassland, 5.9.1949; 3426, Culcairn, fairly common in railway enclosure, early fl. 8.8.1949; 3457, Burrumbuttock, grassland, 22.8.1949; 4837, Lehmann's Reserve, Walla Walla, grassland, mostly fr. 23.9.1950. Fl. Aug.-Oct.

Widespread, of similar habitat and distribution as its congeners, but found more often with *H. glabella* in drier sites.

IRIDACEAE

Romulea *Maratti*

* **R. rosea** (*L.*) *Eckl.* "Onion Grass", "Plum Puddings". 1098, Holbrook, 28.9.1947; 3763, Monument Hill, Albury, end of fl. mostly fr. 12.10.1949. Occasional plants in flower at Rand on 22.8.1949; early fl. Ettamogah on 27.8.1949; fl. Howlong, Brocklesby districts on 1.9.1949; abundant fl. Jindera township, 4.9.1950; commenced to set fruit in Albury area about 24.9.1949, with abundant fr. on 14.10.1949. Fl. Aug.-Oct.

Prefers roadsides and non-cultivated land, being a dominant species in many pastures during late winter and early spring. Along miles of roadways throughout the area. The corms assist in producing a relatively vigorous growth in contrast to that of grasses under average seasonal conditions, but particularly after a dry autumn. Its palatability to stock varies with individual species; horses are fond of it at certain stages of growth only. In cattle, it has been involved in digestive upsets, the plant disintegrating into fibrous strands similar to unravelled hemp after ingestion.

* **R. minutiflora** *Klatt.* 3530, Comer Reserve, 6 miles S.W. of Henty, in gravel of stock tank bank, 5.9.1949; 3497, Oil Tree Lagoon, Balldale, in damp depressions of clay pans, 1.9.1949; 4836, Lehmann's Reserve, Walla Walla, in grassland, 23.9.1950; 4812, Waterworks Reserve, Albury, diffuse but not uncommon over ½ acre of grassland, 5.9.1950; no flowers could be seen at this site on 30.9.1950, suggesting a restricted flowering period. Observed at Burrumbuttock, near wool shed at site of wheat screenings, abundant fl. 28.8.1951. Fl. mid-Aug.-Sept.

Localities indicate that this plant is well established in the western half of the area especially in the wheat belt.

Gynandriris *Parlat.*

* **G. setifolia** (*L.f.*) *R. C. Foster.* 5082, Ryan, near Henty, in clay silt mud of roadside, fl. 13.10.1950.

Iris *L.*

* **I. pumila** *L.* 1218, fl. blue-lilac, large patch on Hume Highway N. of Holbrook, 10.10.1947. A similar species has become naturalised forming patches of up to half an acre in the Burrumbuttock and Howlong districts, Monument Hill, Albury, and Paddy's River, Tumbarumba.

Patersonia *R. Br.*

P. sericea *R. Br.* Recorded for the Hume River (Jephcott), and Pine Mount (C. French) in the adjacent N.E. Victoria by Williamson (1928, p. 221).

Homeria *Vent.*

* **H. collina** *Vent.* "Cape Tulip". 4972, 4973, Brooklyn Bridge, Walla Walla, patch of ¼ acre in grassland, fl. 26.9.1950; 4961, 4962, Gerogery West, garden, fl. 4.10.1950; 5582, 4 miles N. of Henty, small clump on roadside, fl. 3.10.1951. Small clump fl., Huon Reserve, Burrumbuttock, 8.10.1951; Lavington garden, 14.10.1951.

Cultivated in gardens in the wheat belt, e.g., Jindera, Burrumbuttock, Alma Park and Lavington, showing little tendency to spread.

Sisyrinchium *L.*

* **S. micranthum** *L.* "Scour-weed". 5354, Tunnel Road, Woomargama, in grassland of shallow gully, fl. and fr. 18.11.1950.

Sparaxis *Ker*

* **S. tricolor** (*Curt.*) *Ker.* 3741, 3742, Albury, spontaneous in garden, fl. 12.10.1949. Spontaneous in Albury Cemetery grounds.

Ixia *L.*

† **I. columellaris** *Ker.* 2666, Albury, free growth in garden, 21.11.1948. Commonly cultivated.

† **I. paniculata** *De La Roche.* 5929, Balldale, cultivated in garden, 7.11.1952.

Crocosmia *Planch.*

† **C. × crocosmiiflora** (*Hort. ex Lemoine*) *N.E. Br.* "Montbretia". 645, Tumbarumba, free growth in garden, 12.2.1947.

Commonly cultivated hybrid of *C. pottsii* (Bak.) N.E. Br. and *C. aurea* Planch.

Tritonia *Ker*

***T. lineata** (*Salisb.*) *Ker.* 5654, railway enclosure, 2 miles S. of Gerogery, large patch in waste land, fl. 31.10.1951. Commonly cultivated.

Chasmanthe *N.E. Br.*

† **C. floribunda** (*Salisb.*) *N.E. Br.* 5607, Huon Reserve, Burrumbuttock, persistent on old homestead site, fl. 20.10.1951.

CANNACEAE

Canna *L.*

† **C. × generalis** *L. H. Bail.* "Canna". Commonly cultivated and very hardy.

ORCHIDACEAE

Thelymitra *Forst. et f.*

T. aristata *Lindl.* 5211, 5333, Railway Reserve, Tumbarumba, here and there in scrub land, 26.10.1950, 11.11.1950.

T. nuda *R. Br.* "Sun Orchid". 5107, Monument Hill, Albury, uncommon in scrub land, 15.10.1950. Recorded for Albury, Fellowes, 11.1905 in Rupp (1943, p. 9).

T. pauciflora *R. Br.* 5328, Tumbarumba township, occasional clumps in semi-cleared woodland, 11.11.1950.

Diuris *Sm.*

D. punctata *Sm.* 5561, 4 miles N. of Henty, small clump in railway enclosure, fl. 3.10.1951; 5371, Culcairn Road, 4 miles N. of Gerogery, about 8 plants in small clump on roadside adjacent to railway line. Predominantly white flowered with mauve or purple mottlings which intensify on drying, 21.11.1950.

D. maculata *Sm.* 1941 (in part), Monument Hill, Albury, 4.9.1948; 1950 (in part), Trig. Stn. Hill, West Albury, plentiful, 5.9.1948; 5210, Railway Reserve, Tumbarumba, scrub land, 26.10.1950.

D. flavopurpurea *Messmer.* 1941 (in part), Monument Hill, Albury, 4.9.1948; 1950 (in part), 4818, Trig. Stn. Hill, West Albury, common, 5.9.1948, 11.9.1950.

D. sulphurea *R. Br.* 5190, Railway Reserve, Tumbarumba, common in scrub land, about 2,200′, 26.10.1950; 5274, The Glen, Tumbarumba, in open forest, 9.11.1950.

D. pedunculata *R. Br.* 5171, Munderoo West, Tumbarumba, occasional plants scattered over grassland, about 2,200′, 24.10.1950; 5230, The Glen, Tumbarumba, occasional clumps in grassland, 26.10.1950. Recorded, No. 2068, Beechworth Road, Leneva (N.E. Vic.), on hard slate of roadside bank, 26.9.1948.

Microtis *R. Br.*

M. unifolia (*Forst. f.*) *Reichb. f.* 4333, Mason's Hill, Tumbarumba, here and there in open forest, 28.12.1949; 4323 (in part), Munderoo Creek, Mannus, marshy area, mixed with sedge flora, 27.12.1949; 5369, Ryan, near Henty, at margin of shallow roadside pool, 21.11.1950; 5373, Alma Park, near Culcairn, quite common in cemetery, 18.10.1950; 2696, Monument Hill, Albury, scattered in grassy slope of hillside, 28.11.1948.

Widespread and frequent in the area prefering moister sites.

M. parviflora *R. Br.* 4323 (in part), Munderoo Creek, Mannus, here and there in marshy area mixed with sedge flora, 27.12.1949; 5352, Tunnel Road, Woomargama, in shallow gully, 18.11.1950.

M. oblonga *Rogers.* 5408, Mullengandra, mixed in tussocks of *Carex appressa* in swampy depressions of gully, 13.12.1950.

Pterostylis *R. Br.*

P. curta *R. Br.* 1949, Western Hill, Albury, in open forest, 5.9.1948.

P. nutans *R. Br.* 5166, Munderoo West, Tumbarumba, common in open forest land, about 2,200′, end of fl. 24.10.1950; 5277, The Glen, Tumbarumba, open forest, 9.11.1950.

P. acuminata *R. Br.* "Sharp Greenhood". Recorded, No. 2532, Indigo Falls, Leneva (N.E. Vic.) 20.9.1948.

P. pedunculata *R. Br.* "Little Red Riding-hood". Recorded, No. 2533, Indigo Falls (N.E. Vic.), 20.9.1948.

P. mutica *R. Br.* 4955, 5375, Tennis Court Reserve, Alma Park, common in grassland, 26.9.1950, 18.10.1950; 4963, Jindera Common, diffuse but consistent in grassland, 4.10.1950.

P. squamata *R. Br.* E. Muir, Vic. Nat., LXII (1946), 68, quotes Garnet, "plants that Fitzgerald identified as *P. squamata* came from around Urangeline in the Riverina, since settled and sown with wheat and grazed."

Calochilus *R. Br.*

C. robertsonii *Benth.* 5206, Railway Reserve, Tumbarumba, occasional in scrub land, about 2,200′, 26.10.1950.

C. paludosus *R. Br.* 3753, Monument Hill, Albury, occasional in scrub land, 12.10.1949.

Acianthus *R. Br.*

A. fornicatus *R. Br.* "Pixie Caps". 1765, Table Top, in crevices of granite outcrops, not common, 10.6.1948.

Eriochilus *R. Br.*

E. cucullatus (*Labill.*) *Reichb. f.* "Parson's Bands". 3293, Monument Hill, Albury, uncommon, growth after "burning off", 8.5.1949.

Caladenia *R. Br.*

C. dilatata *R. Br.* 5192, Railway Reserve, Tumbarumba, common in scrub land, about 2,200′, 26.10.1950; 5167, Munderoo West, Tumbarumba, occasional in forest, 24.10.1950. Recorded, Albury, Patterson, 10.1916, in Rupp (1943, p. 60).

C. concolor *Fitzg.* Recorded for Tumbarumba, Gordon, 1899, in Rupp (1943, p. 62).

C. carnea *R. Br.* 2130, 5151, The Glen, Tumbarumba, in open forest grassland, 4.10.1948, 24.10.1950; 5168, Munderoo West, Tumbarumba, open forest, about 2,500′, 24.10.1950; 4863, 2 miles S.E. of Balldale, in *Callitris glauca* reserve, 24.9.1950; 1943, Monument Hill, Albury, very common in open forest, 4.9.1948. Fl. Sept.-Oct.

Widespread and common over the area, mostly in bush and scrub lands.

C. alba *R. Br.* 5169, Munderoo West, Tumbarumba, in open forest, about 2,500′, 24.10.1950.

C. congesta *R. Br.* Recorded for Cockatoo, near Holbrook, Forsyth, 11.1900, in Rupp (1943, p. 66).

C. angustata *Lindl.* 5207, 5208, Railway Reserve, Tumbarumba, scrub land, about 2,200′, 26.10.1950.

C. caerulea *R. Br.* 1944, Monument Hill, Albury, in open forest land, 4.9.1948; 4819, Nail Can Hill, Albury, scrub land, 11.9.1950.

Glossodia *R. Br.*

G. major *R. Br.* 5173, Munderoo West, Tumbarumba, forest lands, 24.10.1950; 5003, Tunnel Road, Woomargama, here and there in scrub lands, 2.10.1950; 4992, Talmalmo (Dora Dora), in forest land, 2.10.1950; 1945, Monument Hill, Albury, common in open forest, 12.9.1948. Recorded for Tallangatta Valley (Vic.) as plentiful by Nicholls (1931, p. 142).

Widespread and consistent in forest and scrub lands but never noted to be plentiful.

Gastrodia *R. Br.*

G. sesamoides *R. Br.* "Potato Orchid". Recorded for Holbrook, Forsyth, 11.1900 in Rupp (1943, p. 104).

DICOTYLEDONEAE

CASUARINACEAE

Casuarina *L.*

C. stricta *Ait.* "Hill Oak". 4430, Pleasant Hills, common around township, fl. and fr. 15.8.1949. 2671, Howlong, fairly plentiful on stony hillside, 19.11.1948; 1829, Monument Hill, Albury, not common, 10.7.1948. Observed to be common on Macreadie's Reserve, N. of Henty; Tonk's Reserve, Burrumbuttock.

Sparsely distributed throughout the western portion of the area, especially in the wheat belt.

C. luehmannii *R. T. Bak.* "Bull Oak". 1830, Alma Park Road, Walla, Walla, small patch near roadside, 8.7.1948; 3271, Wallandool, near Henty, fairly common in district, 25.4.1949.

Plentiful in Howlong and Brocklesby district, Oil Tree Lagoon near Balldale and scattered patches around Gerogery. Confined to the western section of the area in company with *Callitris glauca.*

§ **C. cunninghamiana** *Miq.* "River Oak". 2697, Monument Hill, Albury, cultivated in arboretum, 28.11.1948, also in Albury Botanic Gardens. Recorded outside area by Cambage (1904), on the first ten miles of Wagga Wagga-Tumbarumba Road.

SALICACEAE

Salix *L.*

† **S. caprea** *L.* "Goat Willow". 5532, Mullengandra, cultivated, fl. 13.9.1951.

† **S. babylonica** *L.* "Weeping Willow". 1241, Holbrook Park, fl. 9.1947. Extensively cultivated in parks and used for soil erosion control in scours.

Ournie Station was described as "having fine willows that weep over Ournie Creek" by "Traveller" (*Border Post,* 30.12.1879). The same correspondent in the issue of 15.11.1879 noted that Jingellic Station is "remarkable for its ancient and numerous willows—they margin the Murray for a considerable distance—two giants sheltering the door; one of these measures 12 feet in girth four feet from the ground".

* **S. alba** *L.* "White Willow". 5035, Howlong Road, Albury, fl. 5.10.1950; 3664, Mungabarina Reserve, Albury, common along the banks of the Murray River, fl. 1.10.1949.

It is probably this species that has become naturalised extensively along the course of the Murray River from Khancoban to Jingellic and at various parts lower down the river. Reference is made to willows at Tintaldra by "Telemachus" in his book on Albury (John Sands, Sydney, about 1890): "interspersed with frequent willows, for every willow twig broken away by a storm and washed down by the flood, roots here and grows".

Other species of *Salix* are occasionally cultivated in the area.

Populus *L.*

† **P. alba** *L.* "White Poplar". Excellent specimens are present in Holbrook, but the free suckering proves troublesome. Cultivated at Upper Wantagong (Miss Jocelyn Henderson, p.c.).

† var. "Bolle's Poplar". Cultivated in parts of the district. This clone of *P. alba* L. has been known as *P. alba* L. var. *pyramidalis* Bunge and *P. alba* L. var. *bolleana* Lauché.

† **P. nigra** *L.* var. "Lombardy Poplar". Commonly cultivated. An excellent avenue at Carabost, environs of Holbrook and in several other parts. This clone of *P. nigra* L. has been known as *P. nigra* L. var. *italica* Du Roi.

† **P. deltoides** *Marsh.* "Cottonwood". Retailed by local nurserymen. Cultivated at Upper Wantagong (Miss Jocelyn Henderson, p.c.).

CORYLACEAE

Carpinus *L.*

† **C. betulus** *L.* "European Hornbeam". 414, Welaregang, cultivated, 27.12.1946; 3136, Albury, garden, fr. 27.2.1949; 4383, Albury Botanic Gardens, fr. 22.1.1950. Occasionally cultivated.

BETULACEAE

Betula *L.*

† **B. papyrifera** *Marsh.* "Paper Birch". 636, Woomargama, cultivated, 6.2.1947. Observed in several Albury gardens.

FAGACEAE

Fagus *L.*

† **F. sylvatica** *L.* "Beech". 3840, Albury Botanic Gardens, cultivated, 24.10.1949.

Quercus *L.*

† **Q. cerris** *L.* "Turkey Oak". 1056, Welaregang, cultivated, 27.12.1946.

† **Q. robur** *L.* "English Oak". 1038, 1054, 1055, Welaregang, cultivated, 27.12.1946; 1057, Holbrook, street tree, 8.12.1946. Commonly cultivated, especially in Albury streets.

† **Q. lusitanica** *Lam.* "Lusitanian Oak". 1036, 1037, Welaregang, cultivated, 27.12.1946.

† **Q. ilex** *L.* "Holm Oak". 344, Welaregang, cultivated 27.12.1946. A tree labelled "*Q. ballota*, S.W. Europe", in Albury Botanic Gardens may be *Q. ilex* L. var.; 4958, Gerogery West, ornamental tree, 4.10.1950.

† **Q. rubra** *L.* Cultivated in Albury Botanic Gardens.

† **Q. virginiana** *Mill.* "Live Oak". 3847, Albury Botanic Gardens, cultivated, fl. 24.10.1949; 416, Welaregang, cultivated, 27.12.1946.

† **Q. suber** *L.* "Cork Oak". 3874, Howlong, cultivated in homestead yard, fl. 26.10.1949.

† **Q. palustris** *Muenchh.* "Pin Oak". Cultivated in Albury Botanic Gardens.

† **Q. incana** *Roxb.* 2804, Albury, garden, 19.12.1948.

Castanea *Hill*

† **C. sativa** *Mill.* "Chestnut". 4594, Mullengandra, cultivated, fr. 11.3.1950.

ULMACEAE

Ulmus *L.*

† **U. procera** *Salisb.?* "English Elm". One of the commonest ornamental trees in the area; fine avenues may be seen in Albury streets.

† **U. parvifolia** *Jacq.* "Chinese Elm". 4388, Albury Botanic Gardens, 22.1.1950.

Zelkova *Spach.*

† **Z. serrata** (*Thunb.*) *Makino.* 5809, Albury, ornamental street tree, fr. 22.12.1951.

Celtis *L.*

† **C. australis** *L.* "European Nettle Tree". Commonly planted as an ornamental tree in Albury.

MORACEAE

Morus *L.*

† **M. nigra** *L.* "Black Mulberry". 2438, Albury, cultivated, 19.9.1948.

† **M. alba** *L.*, etc. Discussing the possible establishment of the silkworm industry at Albury, the *Border Post* of 27.7.1863, comments that the white mulberry grows "with us most luxuriantly—cuttings taking root and throwing out large leaves. We have a few leaves before us . . . [which] . . . measure upwards of 14 inches, both in length and breadth". The species mentioned may have been *M. alba* L. var *multicaulis.*

The Corowa notes of the issue of 15.10.1873 state that it is "astonishing to witness the vast proportions to which the mulberry growing is being carried. Here we have the *Morus alba* in all its varieties—growing in tens of thousands. Here we have mulberries from China, India, the Cape of Good Hope, America, Spain and Italy, all thriving". An editorial in the same paper of 10.12.1873 discussing the establishment of sericulture in the district, remarks, "The *Morus alba* (the white-fruited mulberry), we consider the best feed, and the seed of this tree, we shall, no doubt, in time get from France and Italy. At present the *Multicaulis* is the only mulberry to be had in the district".

A review of sericulture in Albury in the *Border Post* of 16.11.1878, mentions acres of mulberry trees at Lavington, 3 miles north of Albury. Mr. John Howard's property bore 500 mulberry trees to the acre with the addition of 8,000 plants of "*Alba*" and "*Japonica*" species. Thos. Affleck had 20 acres of which 17 were planted with 13,000 mulberry trees—"11,000 were *Morus Japonica* which were grown from seed imported from France".

Despite the extensive cultivation of those times the plantations are now extinct.

Maclura *Nutt.*

† **M. pomifera** (*Rafin.*) *Schneider.* "Osage Orange". 4460, Howlong Road, Albury, cultivated as an avenue, fr. 1.2.1950. The *Border Post* of 2.4.1884 remarks on a very fine Osage orange hedge "over seven feet high and form[ing] a substantial breakwind".

Ficus *L.*

§ **F. macrophylla** *Desf. ex Pers.* "Moreton Bay Fig". Cultivated at Gerogery and Albury; one tree observed in Pleasant Hills township. Successful but uncommon.

§ **F. rubiginosa** *Desf. ex Vent.* "Rusty Fig". 4408, Albury Botanic Gardens, cultivated, fr. 22.1.1950.

CANNABIACEAE

Humulus *L.*

† **H. lupulus** *L.* "Hop". 685, Holbrook, cultivated and making free growth over garden greenhouse, 1.3.1947.

Cultivated as long ago as 1884, since a correspondent on a journey to Tumbarumba noticed that "the flats along the Tumbarumba Creek are most admirably suited for hops and some plants at Hong Lee's plantation convinced me of the fact. These were in good flower and quite equal to any seen in any part of Gippsland" (*Border Post,* 2.4.1884). The Dora Dora (Talmalmo) Estate was advertised in the issue of 1.10.1889 as having rich alluvial admirably adapted to the cultivation of tobacco, hops, vines and cereals. A prize for 2 lbs. of locally grown hops was awarded at the Tumbarumba Show in March, 1890 (*Border Post,* 21.3.1890). No commercial cultivation is undertaken at the present time.

URTICACEAE

Parietaria *L.*

P. debilis *Forst. f.* "Forest Pellitory". 5024, 5581, Walbundrie, common under rocks on hillside, fl. 4.10.1950, 8.10.1951; 3817, Goombargana Hill, under granite rocks, fl. 18.10.1949; 4942, 8 miles N. of Balldale, under rocks, 25.9.1950; 4678, 5135, Walla Walla district, rocky outcrops little fl., 29.6.1950, fl. 17.10.1950; 4765, Howlong, between rocks on rugged hillside, fl. 17.8.1950. Fl. irregular.

Observed only on dry, shaded sites, often between clefts of rocky outcrops. Even in heavily rabbit-infested country this plant is rarely touched and flourishes.

Urtica *L.*

* **U. urens** *L.* "Dwarf Nettle". 304, Tumbarumba, 1.1.1947; 3462, Rand, clumps in grassland, early fl. 22.8.1949. Fl. irregular.

Widespread in waste places and settled areas, stock- and saleyards.

U. incisa *Poir.* "Scrub Nettle". 153, Little Billabong, 12.12.1946; 4525, Wymah Gap, tall dense stands in soakages, fl. and fr. 28.2.1950. Dense clumps observed fl. at Carboona Gap, Tumbarumba on 7.11.1949; 3716, Horse Shoe Lagoon, Albury, along moist banks of watercourses, 7.10.1949. Fl. irregular, at least for the most part of the year.

Widely spread but not common. Usually in forest lands and gullies.

PROTEACEAE.

Persoonia *Sm.*

P. rigida *R. Br.* 3431, 4714, Nail Can Hill, Albury, uncommon, fr. 14.8.1949, 23.7.1950.

Grevillea *R. Br. ex Knight. corr. R. Br.*

§ **G. robusta** *A. Cunn. ex R. Br.* "Silky Oak". Commonly cultivated in many towns throughout the area, especially in the wheat belt.

G. polybractea *H. B. Williamson.* Recorded for Granya (Vic.), by Williamson (1929, p. 259) and for Tallangatta and Corryong by Ewart (1930 p. 412).

§ **G. linearifolia** (*Cav.*) *Druce.* 3934, 4395, Albury Botanic Gardens, cultivated, fl. 2.11.1949, fl. 22.1.1950.

§ **G. thelemanniana** Endl. 3929, Albury Botanic Gardens, cultivated, fl. 2.11.1949.

§ **G. aspleniifolia** *R. Br.* 5734, Bungowannah, cultivated, fl. and fr. 28.11.1951.

G. lanigera *A. Cunn.* 3890, Burrumbuttock, cultivated, 28.10.1949; 4826, Nail Can Hill, Albury, clumps scattered in open forest and scrub land, 11.9.1950.

G. sp. aff. **G. lanigera** *A. Cunn.* A yellow-orange to red flowered shrub is very common on Monument and Nail Can Hills at Albury and environs. This group of species is under revision.

Hakea *Schrad.*

H. microcarpa *R. Br.* 5180, 5345, Munderoo West, Tumbarumba, mixed with *Epacris breviflora* forming heath scrub along water-courses, in bud, 24.10.1950, fl. 13.11.1950.

§ **H. laurina** *R. Br.* 1760, Culcairn, garden shrub, fl. 8.6.1948; observed fl. in Burrumbuttock garden, 26.9.1949; 2970, Hume Weir, cultivated, in bud, 16.1.1949. Cultivated, uncommon.

Lomatia *R. Br.*

L. myricoides (*Gaertn. f.*) Domin. 5447, Paddy's River, Tooma, along creek banks but not common, fl. 26.12.1950.

Banksia *L. f.*

B. marginata *Cav.* A single tree, about 20′-30′ on a hillside with *Eucalyptus macrorhyncha,* with serrated leaves about 2″ long and white underneath, cones 4″ long, was observed at The Glen, Tumbarumba. It was destroyed in clearing operations before specimens could be obtained. No other specimen has been observed in the area.

Reports would indicate that Banksias once occurred within the area. Hodgkinson, in a report to the Surveyor-General of Victoria in 1836, concerning the Murray River District, describes the area from Albury to the Ovens and near Indigo Creek and Black Dog Creek as embracing "a few small plains clear of timber, but for the most part wooded by the box variety of eucalyptus, banksias and on the arenacious sites by cypress pine and callitris pyramidalis" (*Border Post,* 13.6.1857). Assuming the identification to have been correct, one must conclude that this genus is now almost extinct within the area; it is certainly very rare.

Stenocarpus *R. Br.*

§ **S. sinuatus** *Endl.* "Wheel Tree". Observed cultivated in Albury Botanic Gardens and homesteads at Burrumbuttock. Uncommon.

§ **S. salignus** *R. Br.* 3930, 4397, Albury Botanic Gardens, cultivated, fr. 2.11.1949, early fr. 22.1.1950.

SANTALACEAE

Exocarpos *Labill.*

E. cupressiformis *Labill.* "Native Cherry". 5177, Munderoo West, Tumbarumba, open forest, 24.10.1950; 4571, Walbundrie, hilltop amid granite rocks, 6.3.1950. Observed on hills at Tumbarumba, Holbrook and Albury. Widespread but uncommon.

E. strictus *R. Br.* 4011, Laurel Hill Road, Tumbarumba, fairly common, fl. 8.11.1949; 5221, Adelong Road, Tumbarumba, shrubs in roadside seepage, fl. 26.10.1950.

Eucarya *Mitchell*

E. acuminata (*R. Br.*) *Sprague et Summerhayes.* "Quandong", 3125, Goombargana Reserve, near Walbundrie, fl. 25.2.1949; 3387, one mile west of Pleasant Hills, small clump on roadside, fr. 11.7.1949.

Confined to the western portion of the area and, prior to settlement, probably common in the Walbundrie and Pleasant Hills districts; now rare. One property near Pleasant Hills is still known as "Quandong Park". It is considered that lack of regeneration of Quandongs is due to the disappearance of emus from the district. A theory persists that the seeds must pass through the digestive system of an emu before it will germinate but Zimmer (1946) is probably more correct in suggesting that the emu's role is simply that of a distributing agent. Tahl (1946) considers that the Quandong, like other members of the Santalaceae, is a partial parasite on other trees and is found in scrubby country, where it follows the denser thickets. In view of this, regeneration can scarcely be expected in the wheat belt with the large-scale denudation of tree growth. "Quandongs from the bush" were exhibited at the first Albury and District Agricultural Exhibition (*Border Post,* 28.11.1857).

LORANTHACEAE

Amyema *Tiegh.*

A. pendula (*Sieb. ex Spreng.*) *Tiegh.* 3247, Mullengandra, common on *Eucayptus macrorhyncha,* 22.4.1949.

A. miquelii (*Lehm. ex Miq.*) *Tiegh.* 4514, Wymah Gap, on *Eucalyptus polyanthemos,* 28.2.1950.

POLYGONACEAE

Emex *Neck.*

* **E. australis** *Steinh.* "Spiny Emex". 5394, Henty, common in sheep pens of saleyards, 24.11.1950. Doubtfully recorded for Bungowannah. Uncommon.

Rumex *L.*

R. brownii *Campd.* 465, Cookardinia, 21.12.1946; 2025, Monument Hill, Albury, plentiful, 18.9.1948. Fl. spring.

Widely spread and common in moist areas, including grasslands.

R. dumosus *A. Cunn. ex. Meisn.* "Wiry Dock". 5104, Bulgandry, clump in old quarry pit, 16.10.1950; 3819, Wallandool, near Urangeline, swampy depressions on roadsides, 18.10.1949.

Recorded only in the western section of the area and there uncommon.

* **R. obtusifolius** *L.* 5329, Tumbarumba township, moist site in roadside gutter, 11.11.1950.

R. tenax *Rech. f.* 4275, 4699, Walbundrie, roadsides, mainly fr. 20.12.1949, 14.7.1950; 1818, Howlong, roadside drain, 14.5.1948; 3076, railway gates, Henty, 15.2.1949. Fl. irregular.

* **R. conglomeratus** *Murr.* "Clustered Dock". 463, Holbrook, in swamp, 21.12.1946; 4510, Cumberoona Reserve, Bowna, in swamps, fr. 28.2.1950; 2740, Albury Abattoirs Yard, plentiful in drain, 2.12.1948. Recorded 2983 for Wodonga Saleyards (Vic.), 15.1.1949. Fl. Nov.-Jan.

Predominantly in waste places, widespread and fairly common.

* **R. crispus** *L.* "Curled Dock". 464, Holbrook, 21.12.1946; 4278, Burrumbuttock, railway yard, 20.12.1949; 3299, Gerogery, plentiful on railway embankment, 15.5.1949; 4510, Cumberoona Reserve, Bowna, swamps, fr. 28.2.1950; 4436, Bungowannah-Jindera Road, clumps along dam bank, mature fr. and young growth fl. 1.2.1950; 3005, Murray River, Albury, common on flats, 22.1.1949. Fl. Dec.-May.

Often forms dense clumps in waste places, particularly in surface drains in towns, where dense, characteristic, reddish-brown stands occur to 3′ high.

* **R. pulcher** *L.* 4373, Waterworks Reserve, Albury, clumps in swampy areas, 15.12.1949.

† **R. sagittatus** *Thunb.* 3218, Albury, free-growing, cultivated climber, 3.4.1949. Commonly cultivated in Albury.

† **R. vesicarius** *L.* 5657, Culcairn, cultivated in garden, of vigorous growth, fl. and fr. 31.10.1951.

* **R. acetosella** *L.* "Sorrel". 353, 4286, The Glen, Tumbarumba, 26.1.1947, 26.12.1949; 112, Mountain Creek, Holbrook, common weed, 18.12.1946; 3773, Monument Hill, Albury, full fl. 12.10.1949 and fl. at same site on 12.2.1950. Fl. spring to early summer, but extending to autumn with favourable seasonal conditions.

Widespread but reaching maximum development in old cultivation paddocks and generally considered to indicate sour and exhausted soils. Involved in stock mortalities in Albury district, presumably causing fixation of serum calcium by oxalates, but this effect may have been caused, in part, by associated *Oxalis* spp.

Long established in the area as recorded by the *Border Post* of 8.10.1862: "Perhaps one of the greatest nuisances to the farmer is the growth of the weed called sheep sorrel, which unfortunately is propagating itself extensively around Albury. The weed grows from the root as well as the seed. At the present time the sorrel is in flower and may readily be detected by its heads of thousands of small red blossoms no bigger than a pin's head. Patches of this red colour may be seen scattered over many of the wheat fields, and wherever this is observed, the crop of grain is sure to be scanty. Cropping with clover, so successful in eradicating many weeds, entirely fails to kill the sorrel."

Polygonum *L.*

P. prostratum *R. Br.* "Creeping Knotweed". 4300, The Glen, Tumbarumba, roadsides, 26.12.1949; 3140, Culcairn, 8.3.1949; 109, Little Billabong, plentiful in creek, 8.12.1946; 350, Coppabella Creek, Jingellic, creek bed, 27.1.1947; 3105, Noreuil Park, Albury, plentiful as clumps along Murray River banks, 20.2.1949; 3202, Mungabarina Reserve, Albury, common in moist sand, 3.4.1949. Fl. summer, but fruiting material may be collected to June.

Widespread and common. The characteristic habitat is moist, sandy creek banks, roadsides, often forming large clumps with thick, woody roots.

P. hydropiper *L.* "Waterpepper". 610, Munderoo Creek, Mannus, in creek, 24.2.1947; 786, Holbrook, on sandy bank, 4.4.1947; 3246, Mullengandra, common in swamps, 22.2.1949; 3228, Brae Springs, Walla Walla, large clumps along watercourse, 8.4.1949. Recorded No. 3197, Wodonga (Vic.), 27.3.1949. Fl. summer and autumn.

Plentiful along swampy lands of the Murray River and present in most creeks in the area.

P. minus *Huds.* 352, Lankey's Creek, 6.1.1947. Distribution unknown.

P. lapathifolium *L.* 108, 110, Coppabella Creek, Jingellic, plentiful on creek banks, 16.12.1946; 462 Murray River, Jingellic, in swamps, 27.12.1946; 3095, Culcairn, clump in railway enclosure, 18.2.1949; 4593, Mullengandra, along sandy creek banks, 11.3.1950; 3204, Mungabarina Reserve, Albury, in moist sand, 3.4.1949, abundant flowering material at same site on 10.3.1950. Fl. Dec.-March.

Well established throughout the area, often mixed with *P. hydropiper.*

P. plebeium *R. Br.* "Small Knotweed". 3614, 4561, Hovell Reserve, 4 miles W. of Burrumbuttock, abundant on moist clay of dam banks, 23.9.1949, fl. and fr. 2.3.1950. Not observed elsewhere.

***P. aviculare** *L.* "Wireweed". 651, Tumbarumba, garden weed, 24.2.1947; 3101, Noreuil Park, Albury, plentiful, 20.2.1949. Fl. irregular over several months of the year, as early as Sept. or late as June.

Cosmopolitan. Often dominant in summer fallows, where it has some grazing value when young.

§ **P. orientale** *L.* "Prince's Feather". 351, Holbrook, of free growth in garden and tending to become a weed, fl. 7.1.1947; 4202, Jindera, garden plant, full fl. 5.12.1949. Cultivated.

† **P. capitatum** *Buch.-Ham. ex D. Don.* 1402, Albury, garden border plant, hardy and making free growth, 1.2.1948. Fl. at Albury from Feb.-June. Commonly cultivated in gardens.

Muehlenbeckia *Meisn.*

M. cunninghamii (*Meisn.*) *F. Muell.* "Lignum". 3120, Oil Tree Lagoon, Balldale, isolated bushes, 25.2.1949. Confined to the extreme western portion of the area bordering on the western plains.

Homalocladium *L. H. Bail.*

† **H. platycladum** (*F. Muell.*) *L. H. Bail.* "Ribbon Bush". Cultivated in Albury Botanic Gardens.

CHENOPODIACEAE

Rhagodia *R. Br.*

R. hastata *R. Br.* 456, 457, Little Billabong, 29.12.1946, 3.1.1947; 4586, 4589, Mullengandra, occasional plants on high creek bank, fl. and fr. 11.3.1950.

Not a common species; has been observed at other localities but sparingly distributed.

R. nutans *R. Br.* 4652, Cemetery Reserve, Henty, masses at base of shrubs, fl. and fr. 9.6.1950; 3117, Balldale, large clumps in shaded position under bushes, fl. 25.2.1949; 3785, Bulgandry Reserve, Bulgandry, occasional in loose soil under trees, mostly fl. 14.10.1949; 3439, Pleasant Hills cemetery, fr. 15.8.1949; 3315, railway embankment, Culcairn, climbing on wire-netting, 27.5.1949; 2114, Gerogery Common, 29.9.1948; 1848, Eastern Hill, Albury, woody, trailing vine, fr. 17.8.1948. Fl. irregular, at least spring to autumn.

Widely distributed over the wheat areas. A characteristic habit is that of forming dense masses on wire-netting fences. This is well shown in the environs of Henty. This mode of growth is probably conditioned by its intensive grazing as a palatable species. It was once common in pastures but is now restricted to protected areas.

§ **R. spinescens** *R. Br.* 3070, Culcairn, cultivated, 15.2.1949. Occasionally employed as a hedge in Albury gardens.

Chenopodium *L.*

* **C. ambrosioides** *L.* "Mexican Tea". 3280, Billabong Creek, 3 miles west of Culcairn, fairly plentiful on bank, 6.5.1949, 637, Billabong Creek, Holbrook, 21.2.1947. Recorded 1426, Wodonga (Vic.) on road embankment, 21.2.1948. Occasional but not common.

C. pseudomicrophyllum *Aellen.* 3448, Walbundrie Road, Pleasant Hills, herb in loose soil under trees, not plentiful, 15.8.1949; 4362, Grubben Reserve, Henty, in dry grassland, 6.1.1950; 4457, Lockhart Road, 3 miles N.W. of Rand, clumps up to 3′ diameter on roadsides, 9.2.1950; 2045, 2582, Bulgandry Reserve, Bulgandry, in loose soil of sheep camp under trees, 20.9.1948, 15.11.1948; 2785, northern extremity of Oil Tree Lagoon, Balldale, scattered in open, bare ground with sparse tree cover, 13.12.1948; 2795, Henty-Walbundrie Road, Parish of Comer, roadsides, 17.12.1948, observed flowering here on 3.10.1949. Fl. July-Feb., but prolonged by favourable seasonal conditions.

Diffuse distribution over western portion of the area in the wheat belt, favouring open forest lands and presumably extending to the western plains.

C. trigonon *Roem. et Schult.* var. (*C. polygonoides* (*J. Murr.*) *Aellen*). 1823, Henty Saleyards, adhering to rail of fence, 29.5.1948.

* **C. album** *L.* sens lat. "Fat Hen". 3252, The Glen, Tumbarumba, garden weed, 25.4.1949; 615, Holbrook, 6.1.1947; 3223, Walla Walla, abundant in saleyards, 8.4.1949; 2654, Gerogery, 24.11.1948. Early fl., Rand on 28.10.1949; abundant fl. and fr., Albury gardens on 16.4.1950. Fl. Oct. to late winter.

Frequent in fowlyards, saleyards, gardens and waste places. Probably the "chenopodium or good fat hen" noted in Albury gardens in 1852 by Howitt, in his book, "Land, Labour and Gold".—cited by Andrews (1912, pp. 19-20).

C. carinatum *R. Br.* sens. lat. 458, Tumbarumba, garden weed, 1.1.1947; 519, 616, Holbrook, 30.1.1947, 8.1.1947; 4459, Rand, in cultivation paddocks, abundant fl. and fr. 9.2.1950. Recorded for Brocklesby and Gerogery (Albury P.P. Board Office Records). Fl. summer, but fr. material persisting to late winter.

Abundant in pastures, stock camps and yards and fallow lands in summer. Not palatable to stock, but often forms a major proportion of the green herbage in summer fallows.

Atriplex *L.*

§ **A. nummularia** *Lindl.* "Old Man Saltbush". 2960, Table Top, cultivated in garden, 9.1.1949.

A. semibaccata *R. Br.* Recorded for Carabobala Estate, Morven, 12.2.1942 (Albury P.P. Board Office Records).

A. spinibractea *R. H. Anders.* 4622, stock route west of Henty township, scattered over barer ground, 28.4.1950; 4551, Henty, saleyards, 3.3.1950.

A. muelleri *Benth.* 4581, Walla Walla, weed in fowl yard, 14.3.1950.

Bassia *All.*

B. quinquecuspis *F. Muell.* var. **villosa** *Benth.* "Rolypoly". 3081, 1 mile north of Culcairn, two bushes on roadside, 15.2.1949; 4470, Lockhart Road, Rand, occasional on roadside, 9.2.1950. Isolated plants recorded east of Henty, and in parts of the Walbundrie and Brocklesby districts. No tendency to spread.

Duriala (*R. H. Anders.*) *Ulbr.*

D. villosa (*F. Muell.*) *Ulbr.* 3775, 4443, Bulgandry Reserve, Bulgandry, occasional in loose soil under trees, fl. 14.10.1949, fl. 9.2.1950; 4597, 2 miles west of Rand, scattered in grassland, 20.3.1950; 2796, Henty-Walbundrie Road, Parish of Comer, fairly common under trees, 17.12.1948; 2779, northern extremity of Oil Tree Lagoon, Balldale, in barer ground, 13.12.1948. Fl. Oct.-March.

Restricted to sandy loam soils in western portion of the area and there of diffuse distribution.

Kochia *Roth*

† **K. scoparia** (*L.*) *Schrad.* forma **trichophylla** *Hort. ex Schinz et Thell.* "Summer Cypress". 1003, Holbrook, garden, 17.4.1947. Commonly cultivated at lower elevations.

Salsola *L.*

S. kali *L.* Recorded by Ewart in Proc. Roy. Soc. Vict., XXXII (1920), 209 for Wahgunyah, Murray River (west of area), 11.9.1919. The origin was said to be sea-weed packing material; this is unlikely since the species is widespread in inland localities. Recorded No. 4424, Mulwala-Berrigan Road, patch on recently graded road embankment, 26.1.1950. So far not observed within the area.

DYSPHANIACEAE

Dysphania *R. Br.*

D. littoralis *R. Br.* 3403, 4555-7, Hovell Reserve, 5 miles W. of Burrumbuttock, abundant in moist clay along dam banks, 30.7.1949, 2.3.1950; 3404, 4584, dam banks in Burrumbuttock district, mature fr. 30.7.1949, fl. 13.3.1950. Fl. probably irregular.

Observed only in the Burrumbuttock district.

AMARANTHACEAE

Amaranthus *L.*

* **A. hybridus** *L.* 585, Holbrook, garden weed, 8.1.1947; 639, Holbrook, weed near shearing shed, 14.2.1947; 3224, Walla Walla, in saleyards and township, 8.4.1949; 3099, Noreuil Park, Albury, plentiful, 20.2.1949; 3201, Albury, on rubbish heap, 2.4.1949. Fl. summer.

Widespread, often forming dense aggregations in waste places.

* **A. albus** *L.* "Tumbleweed". 589, Holbrook, 30.1.1947; 724, 838, Ournie, plentiful on roadsides, 17.3.1947, 6.4.1947; 4235, Henty, cultivation paddock, early fl. 9.12.1949; 4360, Bethanga Bridge, Thurgoona, road embankment, fl. and fr. 13.1.1950; 3212, 14-Mile Reserve, Howlong Road, Albury, fairly common in grassland, 1.4.1949. Fl. summer and autumn.

Widespread and common in cultivated lands, roadsides and grasslands.

* **A. viridis** "Green Amaranth". 613, Holbrook, garden weed, 6.1.1947; 3154, Table Top, plentiful in railway enclosure, 19.3.1949. Recorded 2978, Wodonga Saleyards (Vic.), 15.1.1949. Fl. summer.

Widespread in cultivated land, fallows and gardens.

A. macrocarpus *Benth.* "Dwarf Amaranth". 459, Cookardinia, 21.12.1946; 641, Holbrook, weed in sheep yards, 14.2.1947. Not common.

† **A. caudatus** *L.* var. 4656, Culcairn, spontaneous at site of discarded bouquets near public hall, fl. 2.6.1950. Commonly cultivated.

Ptilotus *R. Br.*

P. spathulatus (*R. Br.*) *Poir.* 3518, 3700, Cemetery Reserve, Henty, grassland, 2.9.1949, 3.10.1949 (very mature material at this site on 12.12.1949); 3797, 4776, Bulgandry Reserve, Bulgandry, uncommon in red, sandy loam grassland, 14.10.1949, early fl. 21.8.1950; 3878, Walbundrie, uncommon at margin of cultivation paddock, 28.10.1949; 4797, Morebringer, near Howlong, grassland at edge of *Callitris glauca* forest, fl. 25.8.1950. Fl. Aug.-Nov.

Widespread but diffuse in grasslands in the western half of the area.

Iresine *P. Br.*

† **I. herbstii** *Hook f.* 5715, Walla Walla, cultivated as pot plant, fl. 20.11.1951.

Alternanthera *Forsk.*

A. **denticulata** *R. Br.* 157, Carboona Gap, Tumbarumba, 16.12.1927; 3126 3127, Pleasant Hills Road, Henty, uncommon in clay of moist culvert, 1.3.1949; 728, Culcairn Road, Holbrook, 15.3.1947; 4503, Cemetery Reserve, Henty, on moist clay loam, 24.2.1950; 4446, Lockhart Road, 3 miles N.W. of Rand, along culvert drains, 9.2.1950; 1817, Eyre's Canal, Howlong, in moist clay, mature, 14.5.1948; 3324, Horse Shoe Lagoon, Albury, scarce along sheltered creek banks, fl. and fr. 6.6.1949. Fl. Oct.-April, mostly in summer but extending to June. Widespread and common in swampy sites.

* **A. repens** (*L.*) *Kuntze.* "Khaki Weed". 3177, Mundawaddra, N.W. of Grubben, nr. Pleasant Hills, patch in sheep yards, 10.3.1949; 3141, Culcairn Railway Yards, patch nr. siding, 10.3.1949; 3298, 6 miles N. of Howlong, isolated plants in pasture, 6.5.1949; 5488, Table Top, odd plants around cattle yards, 14.3.1951. Reported from Bungowannah, and Morven, east of Culcairn.

Uncommon, confined to wheat areas, but active control measures have restricted spread. Majority of infestations are the result of fodder importations or from travelling stock; the former was exemplified by the 1945 drought in the area.

† **A. philoxeroides** *Griseb.* 354, Woomargama, in garden pond, 16.1.1947.

NYCTAGINACEAE

Boerhavia *L.*

B. diffusa *L.* "Tar-vine". 4579, Bulgandry, here and there in grasslands, 6.3.1950; 2967, Rand Saleyards, 10.1.1949; 3149, Culcairn, plentiful in railway enclosure, 18.3.1949; 4590, Mullengandra, occasional plants along creek banks, 11.3.1950; 3097, Noreuil Park, Albury, forming tangled clumps, 20.2.1949. Fl. Jan.-April.

Common west of the town of Rand, and observed at Henty Saleyards. Confined to the western half of the area and there not uncommon.

Mirabilis *L.*

† **M. jalapa** *L.* "Four O'Clock". 681, 1004, Holbrook, cultivated but troublesome in garden, 26.2.1947, 22.4.1947. Spontaneous in Noreuil Park, Albury. Commonly cultivated and very hardy, but no extensive naturalisation observed.

Bougainvillea *Comm. corr. Spach*

† **B. spectabilis** *Willd.* 590, Holbrook, garden climber, 29.1.1947. Commonly cultivated.

PHYTOLACCACEAE

Phytolacca *L.*

* **P. octandra** *L.* "Inkweed". 3226, railway embankment, 6 miles N. of Gerogery, uncommon, 8.4.1949; fl. and fr. at this site on 24.1.1950 and 2.3.1950; 5512, Jindera, uncommon weed in pigsty, fl. and fr. 9.4.1951; 5490, Bungowannah, occasional plants on hillsides, fl. and fr. 17.3.1951. Recorded No. 3176, Murray Valley Highway, 3 miles E. of Wodonga, 20.3.1949 and 5508, Indigo Falls, Leneva, in the adjacent N.E. Victoria, amongst bracken fern of creek banks, fl. and fr. 26.3.1951. Fl. Jan.-April.

Observed only at these localities within a restricted area.

AIZOACEAE

Fenestraria *N.E. Br.*

† **F. aurantiaca** (*Haw.*) *N.E. Br.* 3757, Albury, cultivated, 12.10.1949. Commonly cultivated.

MOLLUGINACEAE

Glinus *L.*

G. lotoides *L.* "Carpet Weed". 5482, Lockhart Road, 3 miles N.W. of Rand, clumps in "spuey" clay of roadside ditches, fl. 2.3.1951; 4559, 4560, Hovell Reserve, 4 miles W. of Burrumbuttock, scattered on dam banks and in drains, 2.3.1950. Not observed elsewhere.

G. oppositifolia (*L.*) *A.DC.* 4683, Walla Walla, on margin of stock dam bank, fl. and fr. 29.6.1950.

PORTULACACEAE

Montia *L.*

M. fontana *L.* 2133, 3965, The Glen, Tumbarumba, common in swamps and marshy ground, fl. and fr. 4.10.1948, 10.11.1949; 1152, Carboona Gap, Tumbarumba, swamp, 18.10.1947; 4520, 4811, 5000, 5760, Wymah Gap, abundant along watercourses, 28.2.1950, in bud 27.8.1950, fl. and fr. 2.10.1950; mainly fr. 29.11.1951; 5572, Thurgoona, patch in semi-permanent swamp in open grassland; fl. and fr. 30.9.1951; 2030, 2101, 3546, 4815, 5047, Monument Hill, Albury, on shaded, moist, grassed embankment, amongst *Crassula* spp., about 750′, 18.9.1948, 27,9.1948, 4.9.1949, early fl. 11.9.1950, fl. and fr. 8.10.1950. Fl. mainly Sept.-Nov. but extending to Feb. in sheltered sites.

Widespread but of localised distribution; abundant at localities cited.

M. australasica (*Hook. f.*) *Pax et K. Hoffm.* 3665, 4207, Mungabarina Reserve, Albury, abundant on upper margins of lagoons, fl. 1.10.1949, end of fl. 8.12.1949.

Portulaca *L.*

|| **P. oleracea** *L.* "Pigweed", "Purslane". 341, Holbrook, common garden weed, 5.1.1947. Fl. Dec.-April.

Vegetative growth commences from December onwards. Latest fl. and fr. material observed on railway line at Albury on 30.4.1950. Very widespread and abundant in gardens, sheep yards, saleyards, cultivated and waste lands.

Calandrinia *H.B. et K.*

C. eremaea *Ewart.* 5540, Wallandool Reserve, near Urangeline, vestigial between stones on cleared *Callistris glauca* hillsides, fl. 18.9.1951; 5033, 5034, Walbundrie township, in *Callitris* reserve and on rocky knob, 4.10.1950; 4857, 4868, 5709, 2 miles S.E. of Balldale, abundant in *Callitris* forest reserve, 24.9.1950, fr. 19.11.1951; 4930, Triangle Reserve, Brocklesby, patches under dead timber, not plentiful, 25.9.1950. Fl. Sept.-Oct.

Common in *Callitris* forest reserves in the western section and probably confined thereto.

C. pygmaea *F. Muell.* 4872, 2 miles S.E. of Balldale, clumps in sandy soil as ground cover in *Callitris glauca* forest reserve, 24.9.1950.

BASELLACEAE

Boussingaultia *H., B. et K.*

* **B. gracilis** *Miers* forma **pseudobaselloides** *Hauman.* 487, Holbrook, garden climber, 3.4.1947. Observed naturalised at Hume Weir, Albury, on rubbish heap; making vigorous growth in garden at Bowna and fl. Burrumbuttock garden on 13.3.1950. Commonly cultivated.

CARYOPHYLLACEAE

Stellaria *L.*

S. pungens *Brongn.* 140, 1293, Carboona Gap, Tumbarumba, prickly, scrambling herb, 20.12.1946, 26.12.1947; flowering at this site on 6.11.1949. Recorded also, 2718, for Indigo Falls, Leneva (Vic.) and for Mt. Stanley (N.E. Vic.), about 3,300′. Fl. irregular.

Montane species, common on rocky sites of low fertility. Unpalatable to stock and plentiful even in heavily rabbit-infested country.

S. palustris *Retz.* 1289, The Glen, Tumbarumba, in swamps, 26.12.1947; 1093, Holbrook, 28.9.1947; 1679, Cumberoona Reserve, Bowna, swamp plant, 18.4.1948; 4482, Howlong, abundant as dense, soft green carpets in dried-out lagoons, comprising acres in extent, Murray River flats, fl. 22.2.1950. Fl. late spring and summer.

Widespread in swamps, variable in habit; often fine-leaved and forming fringes to lagoons.

* **S. media** (*L.*) *Vill.* 1283, Tumbarumba, garden weed, 12.12.1947. Fl. most of the year, from July to May, but especially in spring and summer.

Common in gardens and cultivated lands, less abundant in pastures.

S. multiflora *Hook.* 3956, The Glen, Tumbarumba, in open forest land, mostly fr. 7.11.1949; 4861, 2 miles S.E. of Balldale, in sandy soil of *Callitris* forest reserve 24.9.1950.

Cerastium *L.*

* **C. viscosum** *L.* "Mouse-ear Chickweed". 2129, The Glen, Tumbarumba, abundant in garden, 4.10.1948; 3640, Howlong Common, 29.9.1949; 3561, Bulgandry Reserve, Bulgandry, moist spots, early fl. 8.9.1949; 2037, Monument Hill, Albury, common garden weed, 18.9.1948. Fl. Tumbarumba and Laurel Hill districts on 7.11.1949. Fl. Sept.-Nov. and at various times throughout the year in sheltered sites.

Widespread in cultivated lands, especially gardens.

Recorded in the minutes of the Albury Pastoral and Agricultural Society, February 1892, as a possible host of "Take All" of the wheat plant following submission of specimens to the Director of Agriculture, Sydney. The Director reported that "Mouse-ear Chickweed" may form a resting place for the fungi, but the most probable cause was wearing out of the ground and defective cultivation (*Border Post*, 19.2.1892).

† **C. tomentosum** *L.* 5739, Bungowannah, cultivated as border plant, fl. 28.11.1951.

Moenchia *Ehrh.*

* **M. erecta** (*L.*) *Gaertn., Mey et Scherb.* 4997, Talmalmo (Dora Dora), in scrub land, 2.10.1950; 3527, Comer Reserve, 6 miles west of Henty, patch on sheep camp, 5.9.1949; 3582, Burrumbuttock, clump in pasture paddock, old manure spot,

early fl. 19.9.1949; 1987, 3771, Monument Hill, Albury, common in damp depressions, 12.9.1948, fr. 12.10.1949; 3624, Waterworks Reserve Albury, grassland, 24.9.1949; 3628, Stock Reserve, Jindera, clumps in paddock, 23.9.1949. Observed to be fairly plentiful in pastures at Tumbarumba, end of fr. on 7.11.1949; flowering in pastures at Thurgoona (20.9.1949), Triangle Reserve, Brocklesby (18.9.1949), Albury Cemetery (26.9.1949). Fl. Sept.-Oct.

Abundant in settled areas, stock reserves and routes. Presumably spread for the most part in animal droppings, as shown by clumps in pastures.

Sagina *L.*

‡ **S. apetala** *Ard.* 2125, The Glen, Tumbarumba, common on bare ground of tennis court, 3.10.1948; 1183, Holbrook, garden weed, 26.10.1947; 2111, Table Top, plentiful in bare, hard clay of homestead yard, 23.9.1948; 2106, 2620, Monument Hill, Albury, in bare ground, 27.9.1948, 21.11.1948. Recorded Chiltern (N.E. Vic.), in clay silt of railway enclosure, 12.9.1949. Fl. mainly spring but with considerable latitude.

Widespread and common in pastures, bare grounds around homesteads, tennis courts and paths.

Spergularia (*Pers.*) *J. et C. Presl.*

‖ **S. rubra** (*L.*) *J. et C. Presl.* 1481, The Glen, Tumbarumba, weed of cultivation, 29.3.1948, fl. material abundant in this district on 7.11.1949; 421, Billabong Creek, Holbrook, 3.1.1947; 643, Holbrook, 14.2.1947; 3266, Table Top, on railroad, but fl. material scarce, 24.4.1949; 4242, Cemetery Reserve, Henty, margins of swamp, 9.12.1949; Eastern Hill Stone Quarry, Albury, 17.8.1948. Fl. Aug.-April, mostly spring and summer.

Widespread in cultivated lands, clay pans, often dominant in fallows. Abundant along foot-paths in many towns, or bare ground around homesteads.

Polycarpon *L.*

‡ **P. tetraphyllum** *L.* 4318, Munderoo Creek, Mannus, not common along banks, 27.12.1949; 5382, Jingellic, moist spots on roadsides, 26.11.1950; 5636, Burrumbuttock, weed in homestead yard, 23.10.1951; 4260, Bake's Reserve, Gerogery, common in moist sand of creek bed, 14.12.1949; 4195, 9-Mile Hill, Albury, patches in shaded position between clefts of granite rocks, 3.12.1949; 3925, Pemberton Street, Albury, not common in crevices of pavement, 3.11.1949; 4621, Murray River, Albury, along banks, fl. 11.4.1950. Also recorded 4249, Hume Highway, Tarcutta, north of the area, on embankment, 28.11.1949. Fl. Oct.-April.

Widespread but not common. Prefers shaded protected areas with higher degree of moisture.

Silene *L.*

† **S. cucubalus** *Wibel.* "Bladder Campion". 3902, Albury garden, cultivated, early fl. 31.10.1949; 5676, Culcairn, cultivated in garden, fl. 9.11.1951.

* **S. gallica** *L.* "French Catchfly". 5087, Ryan, near Henty, abundant in grassland, 13.10.1950; 2087, Table Top, railway line, 21.9.1948. Widespread ruderal species.

* **S. maritima** *L.* 3295, Goombargana, large strip in fallow paddock, not fl. 21.4.1949.

Gypsophila *L.*

† **G. paniculata** *L.* 340, Holbrook, garden plant, 7.1.1947. Observed fl. in Gerogery garden on 2.11.1949. Occasionally cultivated.

Kohlrauschia *Kunth*

* **K. prolifera** (*L.*) *Kunth.* "Proliferous Pink". 4018, The Glen, Tumbarumba, common along roadsides, 10.11.1949; 420, Billabong Creek, Holbrook, 3.1.1947. Abundant fl. material observed along railway line at Table Top on 11.10.1949. Fl. Sept. through to autumn.

Probably long established in the area in view of the record for the adjacent Mt. Alfred, Upper Murray in 1912, by Ewart (1930, p. 499). Widespread ruderal species.

* **K. velutina** (*Guss.*) *Reichb.* 4892, 5 miles N. of Henty, abundant in grassland, full fl. 22.9.1950; 4914, Blue Hill Reserve, Henty, common in grassland, 22.9.1950, 5066, Thurgoona, grassland, 10.10.1950; 3170, Culcairn, railway enclosure, early fl. 3.10.1949. Probably well established in the area in view of the record for the Upper Murray in 1886 by Ewart (1930, p. 500).

Herniaria *L.*

† **H. glabra** *L.* 5754, Bungowannah, cultivated in cracks of pavement, fl. 28.11.1951.

Dianthus *L.*

* **D. armeria** *L.* 4339, Parade Street, Tumbarumba, small patch on roadside depression, fl. 28.12.1949. Not observed elsewhere.

Paronychia *Adans.*

* **P. brasiliana** *DC.* "Chilian Whitlow". 2530, Albury Trucking Yards, extensive patch on hard gravel of roadside, 7.11.1948. Only locality observed.

CERATOPHYLLACEAE

Ceratophyllum *L.*

C. demersum *L.* "Hornwort". 1423, Union Bridge between Albury and Wodonga, submerged in brackish water, 21.2.1948.

Common in lagoons along the Murray River from Albury to Howlong in late summer, in company with *Elodea canadensis* and *Potamogeton* spp.

RANUNCULACEAE

Aquilegia *L.* "Columbine".

† **A.** aff. **A. canadensis** *L.* 3927, Albury, cultivated hybrid form, 2.11.1949.

Paeonia *L.*

† **P. suffruticosa** *Andr.* var. 3843, Albury Botanic Gardens, cultivated, 24.10.1949.

Nigella *L.*

* **N. damascena** *L.* "Love-in-a-mist". 5747, Bungowannah, cultivated, fl. and fr. 28.11.1951.

Helleborus *L.*

† **H. niger** *L.* "Christmas Rose". 3415, Albury garden, cultivated, 7.8.1949. Commonly cultivated.

Anemone *L.*

† **A. hupehensis** *Lemoine,* hort. var. 498, Tumbarumba, cultivated, fl. 6.4.1947.

Clematis *L.*

C. aristata *R. Br.* 4005, Tumbarumba-Laurel Hill Road, occasional, fl. 8.11.1949; 4982, Tunnel Road, Woomargama, trailing over road embankments, uncommon, in bud 2.10.1950; 5223, Adelong Road, Tumbarumba, here and there along roadsides, fl. 26.10.1950. Recorded for Laurel Hill by Cambage (1904), and for Tallangatta Valley (N.E. Vic.) by Nicholls (1931, p. 145). Not observed elsewhere, but cultivated in Albury gardens.

§ **C. microphylla** *DC.* 3828, Jindera, garden, fr. 17.10.1949.

† **C.** aff. **C. lanuginosa** *Lindl.* 3938, Albury Botanic Gardens, cultivated hybrid form, 2.11.1949.

Myosurus *L.*

‡ **M. minimus** *L.* "Mouse tail". 5541, Wallandool Reserve, near Urangeline, common in moist clay, swampy depression or clay pans, 18.9.1951; 2060, 3471, Bulgandry Reserve, Bulgandry, not common, scattered in roadside mud and in swamp, 20.9.1948, 29.8.1949; early fl. at this site on 22.8.1949, abundant on 29.8.1949; 5012, Tonk's Reserve, N. of Burrumbuttock, fairly common in mud of shallow pools in grassland, 4.10.1950. Confined to the western half of the area and there common.

Ranunculus *L.*

R. lappaceus *Sm.* "Common Buttercup". 2851, Laurel Hill, sparingly distributed through forest, 3,000′, 27.12.1948; abundant fl. and fr. material in this district on 7.11.1949; 1127, Railway Reserve, Tumbarumba, 3.10.1947; 1347, 4016, The Glen, Tumbarumba, in swamps, fr. 2.1.1948, mostly fr. 10.11.1949; 1095, Holbrook, swamp, 28.9.1947; 1170, 2-Mile Reserve, Holbrook, in pasture, 11.10.1947; 3503, Culcairn, railway enclosure, end of fl. 1.9.1949; 3734, 3737, Gerogery, railway line, fr. 11.10.1949; 1948, 3396, 3747, Monument Hill, Albury, in open forest, 4.9.1948, 24.7.1949, 12.10.1949. Fl. July-Nov.

One of the commonest species of *Ranunculus;* widely spread in marshy lands and damp pastures.

An observer writing on "A Trip Down the Murray", in the *Border Post* of 16.11.1872 remarks on the river flats below Howlong being covered with "Grass growing luxuriantly with a beautiful mixture of the buttercup, giving the whole a rich varied aspect". The same incidence of *R. lappaceus* Sm. is seen in present day spring pastures.

R. sessiliflorus *R. Br. ex DC.* and forms. 2040, 3460, 3557, Bulgandry Reserve, Bulgandry, swampy land, 20.9.1948, 22.8.1949, 8.9.1949; 2094, Bucki Reserve, Henty, common in pasture, 23.9.1949; 3686, Henty Common, scattered in moist clay margins of dam, 3.10.1948; 1161, Howlong, roadside drain, 16.10.1947; 3429, 3638, Howlong Common, in marshy areas, early fl. 12.8.1949 to 1.9.1949 and fr. 29.9.1949; 2000, 14-Mile Reserve, Howlong Road, Albury, common in pasture, 15.9.1948; 1962, Monument Hill, Albury, in swamp depressions, 5.9.1948; 3666, Mungabarina Reserve, Albury, in land subject to periodical flooding, mostly fr. 1.10.1949. Fl. Sept.-Nov.

Widespread and common. Of no specific habitat; in open pastures, and on grassed hillsides, but of maximum development in moister areas.

* **R. muricatus** *L.* "Sharp Buttercup". 1091, Holbrook, moist clay, 28.9.1947; 3886, Walbundrie, common in roadside drain, mostly fr. 28.10.1949; 3717, Horse Shoe Lagoon, Albury, fl. and fr. 7.10.1949; 3623, Waterworks Reserve, Albury, clumps in moister parts of grassland, 24.9.1949. Observed in swamps in the Tumbarumba district, fl. and fr. 10.11.1949. Fl. Sept.-Nov.

Widespread, but rarely occurs in dense clumps except in occasional drains and ditches; tends to diffuse distribution.

* **R. sceleratus** *L.* "Celery-leaved Buttercup". 137, Munderoo, nr. Tumbarumba, 16.12.1946; 3949, The Glen, Tumbarumba, clumps in swamp, fl. and fr. 10.11.1949; 1256, Tooma, dense stands in swamp, 5.12.1947; 4508, Cumberoona Reserve, Bowna, abundant along watercourse, fl. and fr. 28.2.1950; 3718, 3325, Horse Shoe Lagoon, Albury, in beds of small creek forming dense clumps, 7.10.1949, 6.6.1949. Fl. irregular; mostly late spring and summer, rarely to mid-winter.

Widely spread and common. Tends to occur as dense stands and is a prolific seeder. On mud or in swamps, moist roadsides or ditches.

R. inundatus *R. Br. ex DC.* 2860, Tumbarumba Road, Laurel Hill, floating mass on morass of inland lagoon, fl. 27.12.1948; 5426, Munderoo West Creek, Wolseley Park, semi-floating, tangled masses in bed of swift-flowing stream; mixed with *Hydrocotyle vulgaris* and *Lilaeopsis australica,* fl. and fr. 27.12.1950; 4412, Mungabarina Reserve, Albury, swampy margins of lagoons, end of fr. 31.1.1950.

Widespread as indicated by the diverse localities though noted only at these sites.

WINTERACEAE

Drimys *Forst. et f.*

D. lanceolata (*Poir.*) *Baill.* Recorded for Laurel Hill by Cambage (1904) under the name of *D. aromatica* F. Muell.

BERBERIDACEAE

Nandina *Thunb.*

† **N. domestica** *Thunb.* 396, Holbrook, garden, 7.1.1947; 2988, Albury, garden, 22.1.1949. Commonly cultivated.

Mahonia *Nutt.*

† **M. aquifolium** (*Pursh*) *Nutt.* 1103, Lankey's Creek, spreading naturally on roadside, fl. 6.10.1947. Cultivated in Albury gardens.

Berberis *L.*

† **B. vulgaris** *L.* "Common Barberry". 406, Woomargama, garden shrub, 16.1.1947. Occasionally cultivated.

† **B. wilsoniae** *Hemsl.* 4379, Albury Botanic Gardens, cultivated, 22.1.1950.

LAURACEAE

Cinnamomum *Blume*

† **C. camphora** (*L.*) *T. Nees et Eberm.* "Camphor Laurel". Fine avenue has been planted in Thurgoona Street, Albury. Not commonly cultivated.

PAPAVERACEAE

Papaver *L.*

* **P. hybridum** *L.* "Rough Poppy". 4856, Balldale, common in oat crop, 24.9.1950; 5364, Brocklesby, garden weed, end of fl. 16.11.1950; 4893, Henty, large clump on railway line, fl. 22.9.1950; 3837, Albury Botanic Gardens, weed, mostly fr. 19.10.1949. Observed on tennis court at Jindera, end of fl. 25.10.1949. Fl. Sept.-Nov. widespread and frequent.

* **P. somniferum** *L.* 5560, Culcairn Road, Gerogery, odd plants on roadside, 28.9.1951. Uncommon.

Experimental plantings of the variety known as " Opium Poppy " were made during early settlement as indicated by a paragraph in the *Border Post* of 7.9.1872: " A few months past we noticed a paragraph on the success which attended the efforts of Mr. Hiley of Mullengandra in the cultivation of the poppy last year for the extraction of opium—This gentleman is well satisfied with the first experimental trial and has put in two acres of crop this year ".

Earlier, the issue of 3.1.1872 noted that Mr. Hiley, " had grown this season, on his farm, the real Turkey poppy, from which he had obtained a quantity of superior opium valued at 55s. per pound ". No present cultivation is known.

Eschscholzia *Cham.*

* **E. californica** *Cham.* var. **californica.** 5332, Tumbarumba, spreading from garden to footpath, fl. 11.11.1950; 2544, Culcairn, on rubbish dump in railway enclosure, 9.11.1948; fl. at same site, 2.10.1949 and 24.2.1950. Occasional.

* Var. **crocea** (*Benth.*) *Jepson.* 167, Holbrook, on rubbish heap, 18.12.1946. Spontaneous in several Holbrook backyards.

Romneya *Harvey.*

† **R. coulteri** *Harvey.* 5823, Jindera, very hardy, cultivated plant in garden, fl. 24.12.1951.

Argemone *L.*

* **A. mexicana** *L.* var. **ochroleuca** *Lindl.* " Mexican Poppy ". 4480, Goombargana Hill, nr. Walbundrie, established in cultivated land for several years, fl. and fr. 22.2.1950; 3916, railway line three miles north of Gerogery, isolated plants over 1 chain square, fl. and early fr. 31.10.1949. Uncommon.

FUMARIACEAE

Corydalis *Medic.*

† **C. lutea** (*L.*) *DC.* 116, The Glen, Tumbarumba, cultivated but of free growth, 22.12.1946.

Fumaria *L.*

* **F. muralis** *Sond.* 166, Holbrook, garden weed, 18.12.1946; 402, Woomargama, in garden, 16.1.1947; 1937, 3318, Albury, garden weed, 4.9.1948, 5.6.1949. This appears to be the commonest species present in the area.

* **F. capreolata** *L.* 3424, 3425, Culcairn, weed of backyard, 8.8.1949.

* **F. bastardii** *Bor.* 4273, Walbundrie, margin of cultivation paddock, 20.12.1949; 4732, Hovell Reserve, 4 miles W. of Burrumbuttock, along creek banks, 3.8.1950.

CRUCIFERAE

Lepidium *L.*

L. hyssopifolium *Desv.* " Peppercress ". 2540, Henty, plentiful near trucking yards, 11.11.1948.

* **L. bonariense** *L.* 2791, Bell's Road, Gerogery, in dense clumps, 16.12.1948.

Cardaria *Desv.*

* **C. draba** (*L.*) *Desv.* " Hoary Cress ". 1239, Holbrook, weed of cultivation, 7.11.1947. Occasional in the wheat fields at Walbundrie and Culcairn, has appeared at Brocklesby and Burrumbuttock, and diffuse but not common in parts of the Howlong district. Control measures have limited its spread.

Sisymbrium *L.*

* **S. officinale** (*L.*) *Scop.* "Hedge Mustard". 2681, 3831, Albury, garden weed, fl. and fr. 28.11.1948, 19.10.1949; 3371, Table Top Road, Jindera, isolated plants on roadside, 10.6.1949. Observed to be common in waste lands, Tumbarumba township, fl. and fr. 8.11.1949.

Ruderal species, but not as common as *S. orientale* though seen in diverse localities.

* **S. orientale** *Torn.* "Indian Hedge Mustard". 2539, Henty, plentiful on railway embankment, 11.11.1948; 1099, Ralvona, on railway line, 28.9.1947; 3314, Culcairn, rail-

Ruderal species, but not as common as *S. orientale* though seen in diverse

from July-Dec.

Widespread and common in waste lands and cultivation.

* **S. irio** *L.* 4814, Table Top, railway yard, fl. and fr. 5.9.1950.

Sinapis *L.*

* **S. arvensis** *L.* "Charlock". 769, Mannus, in cultivated land, 24.3.1947; 1001, Holbrook, 1.5.1947; 139, Lankey's Creek, 23.12.1946; 4213, Brocklesby, cultivation paddock, fl. and fr. 1.12.1949., Widespread, especially in the wheat belt.

Brassica *L.*

* **B. campestris** *L.* "Wild Turnip". 3795, Albury, weed in garden, 15.10.1949.

* **B. oleracea** *L.* var. Recorded 2982 for Wodonga (Vic.), small patch in saleyards, 15.1.1949.

* **B. tournefortii** *Gouan.* Appeared in a linseed crop at Holbrook following importation of seed, 12.1941 (G. C. Bartlett, p.c.).

* **B. juncea** (*L.*) *Czernjaew et Coss.* 4877, Henty, occasional along railway line, 22.9.1950.

Raphanus *L.*

* **R. raphanistrum** *L.* "Wild Radish". 1217, Mannus, nr. Tumbarumba, cultivation paddock, 19.10.1947; 1102, Ournie, abundant in cultivation paddock, 4.10.1947; 3281, Gerogery, near wheat silos, 6.5.1949; 3721, Lavington, N. of Albury, weed in orchard, fl. and fr. 5.10.1949. Fl. spring to autumn and later. Very common in the wheat belt; widely spread over most of the area in cultivation lands.

Introduced to the Albury district in the 1902 drought through hay purchased from Ballarat. Up to 1909 was present in only three properties in the Brocklesby district (A. Ross, Brocklesby, p.c.)

Barbarea *B. Ehrh.*

B. australis *Hook. f.* Recorded for Bringenbrong Bridge, (Upper Murray), by Williamson (1929, p. 263) as *B. vulgaris*, R. Br.

Rorippa *Scop.*

R. islandica (*Oeder*) *Borbás.* 584, 3239, Woomargama, very common on margin of ornamental lake, fl. 5.2.1947, fl. and fr. 9.4.1949; 4484, Murray River, Howlong, fairly common along banks, 22.2.1950; 1375, Howlong Road, Albury, 7.2.1948; 1452, Horse Shoe Lagoon, Albury, 28.2.1948; 3211, Mungabarina Reserve, Albury, on river bank, 3.4.1949. Fl. Jan.-May.

Plentiful in lagoons and river banks at Albury, but uncommon away from the Murray River.

* **R. nasturtium-aquaticum** (*L.*) *Hayek.* "Watercress". 605, The Glen, Tumbarumba, plentiful in watercourses, about 2,300′, 24.2.1947; 2613, Brae Springs Reserve, Gerogery, clumps in bed of creek, 17.11.1948; 4539, Cumberoona Reserve, Bowna, common along watercourses, little fl. or fr. 28.2.1950. Fl. Nov.-Feb.

Present in many watercourses in the area, especially at higher elevations.

Lobularia *Desv.*

† **L. maritima** (*L.*) *Desv.* "Sweet Alyssum". Commonly cultivated, occasionally spontaneous on footpaths of towns or on rubbish heaps.

Lunaria *L.*

† **L. annua** *L.* "Honesty". 3823, Jindera, garden, cultivated, 18.10.1949. Commonly cultivated.

Capsella *Medic.*

* **C. bursa-pastoris** (*L.*) *Medic.* "Shepherd's Purse". 3251, The Glen, Tumbarumba, 25.4.1949; 455, Cookardinia, 21.12.1946; 3559, 4639, 4784, Bulgandry Reserve, Bulgandry, 8.9.1949, 1.5.1950, 21.8.1950; 3525, 3537, Comer Reserve, Henty, in grassland, 5.9.1949; 4599, Rand trucking yards, fl. and fr. 20.3.1950; 4463, Waterworks Reserve, Albury, small forms in damp spots after recent rains, 10.2.1950; 3289, Monument Hill, Albury, 8.5.1949. Fl. mainly in spring, otherwise in favoured places at most times of the year.

Widespread and common.

Erophila *DC.*

* **E. verna** (*L.*) *Chevall.* 1079, 2123, The Glen, Tumbarumba, sparingly distributed in pasture, 13.9.1947, 3.10.1948; 3476, Bulgandry Reserve, Bulgandry, in moist localities, 29.8.1949; 3533, Comer Reserve, 6 miles S.W. of Henty, in barer parts of grassland, mostly fl. 5.9.1949. Fl. Aug.-Oct.

Widespread but incidence unknown. Very inconspicuous amongst spring herbage.

Coronopus *Boehm.*

* **C. didymus** (*L.*) *Sm.* 3942, Stanley Street, Albury on footpath, 3.11.1949; 5578, Bulgandry Reserve, Bulgandry, in grassland but not obvious amongst associated growth of *Soliva* sp., fl. and fr. 8.10.1951.

Judging from these diverse localities, one might expect that search will reveal it elsewhere in the area.

RESEDACEAE

Reseda *L.*

* **R. luteola** *L.* "Wild Mignonette". 1237, Walbundrie, roadside weed 6.11.1947; observed in numerous localities, e.g., Ralvona railway yard, stands of one acre; in many parts of the wheat area of Wallandeon, Goombargana and Brocklesby. Fl. irregular.

* **R. lutea** *L.* "Cut-leaf Mignonette". 2597, Hume Weir Road, Albury, scattered plants on roadside, 14.11.1948.

† **R. odorata** *L.* "Mignonette". 3014, Henty, garden plant of strong growth, 25.1.1949.

DROSERACEAE

Drosera *L.* "Sundews"

D. glanduligera *Lehm.* 4898, 5 miles N. of Henty, grassland, 22.9.1950; 4950, Alma Park, diffuse in grassland, 26.9.1950; 4873, 2 miles S.E. of Balldale, not common in sandy coil of *Callitris* forest, 24.9.1950; 2058, Bulgandry Reserve, Bulgandry, common in grassland, 20.9.1948; 4964, Jindera Common, fairly common in bare hard loam soil, 4.10.1950; 5072, Monument Hill, Albury, grassland, 15.10.1950. Fl. Sept.-Oct.

Widespread and frequent in the western half of the area.

D. peltata *Sm.* 1114, Holbrook, plentiful in pasture paddock, 12.10.1947; 5084, Ryan, near Henty, grassland, 13.10.1950; 5058, Thurgoona, grassland, 10.10.1950; 5070, Monument Hill, Albury, scrub land, 15.10.1950.

Similar incidence and distribution to those of *D. auriculata.*

D. auriculata *Backh. ex Planch.* 3990, Carboona Gap, Tumbarumba common, fl. 6.11.1949; 4975, Tunnel Road, Woomargama, in forest, early fl. 2.10.1950; 2027, 3769, Monument Hill, Albury, very common, 18.9.1948, 12.10.1949. Recorded for Tallangatta Valley (Vic.) by Nicholls (1931, p. 144).

A widespread species. In common with other species of *Drosera* it imparts a yellow stain to drying papers; cf. the observation of a "bright-red colouring matter" by Petrie (1914, p. 282).

CRASSULACEAE

Echeveria *DC.*

† **E. rosea** *Lindl.* 1443, Albury garden, 7.2.1948. Commonly cultivated.

Crassula *L.*

C. colorata (*Nees*) *Ostenf.* 4967, 4968, Coreen, abundant on bare ground of granitic ridge and cultivation paddock, 29.9.1950. 3464, Rand township, abundant in barer ground, 22.8.1949; 3692, Cemetery Reserve, Henty, grassland, 3.10.1949; 3506, Balldale, small herb in loose sandy soil of *Callitris* forest, 1.9.1949; 3499, Balldale, plentiful in red sandy loam grassland, 1.9.1949; 1977, Jindera, on grassy slope amid stones, 9.9.1948. Fl. Aug.-Oct.

Widely spread in the western half of the area and common at localities cited.

C. sieberiana (*Schult.*) *Druce.* 4025, The Glen, Tumbarumba, 10.11.1949; 146, 1292, Carboona Gap, Tumbarumba, 3.12.1946, 26.12.1947; 1214, Holbrook Government Tank, in moist pasture, 26.10.1947; 3510, Balldale, sandy soil of roadsides, 1.9.1949; 3882, Walbundrie, common in red sandy loams, 28.10.1949; 3617, Burrumbuttock, moist clay on dam bank, 23.9.1949; 3731, Gerogery, moist spots along railway line, 11.10.1949; 3648, 9-Mile Hill, Wagga Road, Albury, on gravel, 2.10.1949; 1843, Eastern Hill, Albury, in damp depressions, 17.8.1949. Fl. Aug.-Dec.

Widespread and common, especially on rocky slopes, embankments and the barer ground of the western section, reaching maximum development on the sandy loams. Its abundance imparts a red coloration to spring pastures. Very hardy, even under the driest conditions, and relatively unpalatable to rabbits and stock. Together with other species of *Crassula* and many of the smaller Compositae, especially *Stuartina muelleri,* which are seen to the best advantage in spring, it succeeds the rich moss flora seen on the loam soils of the western section of the area during winter. The incidence of the *Crassula* spp. appears to be in direct proportion to that of the mosses.

C. bonariensis (*DC.*) *Cambess.* 5185, Munderoo West, Tumbarumba, damp depressions in open forest, about 2,500′, 24.10.1950; 3479, 4706, Bulgandry Reserve, Bulgandry, very common, giving a reddish coloration to barer ground, 29.8.1949, abundant fl. material in swamp, 14.7.1950; 3526, Comer Reserve, 6 miles S.W. of Henty, abundant in moist situations, 5.9.1949; 3729, 80-Acres Reserve, Gerogery, clumps in damp depressions in grassland, 11.10.1949; 2001, 14-Mile Reserve, Howlong Road, Albury, plentiful in hard bare ground, 15.9.1948; 3712, Horse Shoe Lagoon, Albury, clumps in moist turf with other *Crassula* spp. 7.10.1949. Fl. July-Oct.

Widespread, at least in the western section of the area, forming small dense clumps, but easily overlooked on account of its small size.

C. recurva (*Hook. f.*) *Ostenf.* 2876. The Glen, Tumbarumba, common in morass, about 2,300′, 29.12.1948; 1668, 3059, Mungabarina Reserve, Albury, in moist sand on fringes of lagoons, forming a broad sward, 1.4.1948, 13.2.1949. Recorded, 4420, in irrigation canals, Mulwala, fl. 26.1.1950. Fl. Dec.-April.

Very common along the Murray River, invariably in mud or submerged in water up to 3′ deep, in the latter case sending up slender stems to the surface. These detach from time to time and form aggregations of debris on the surface.

C. macrantha (*Hook. f.*) *Diels et Pritzel.* 2127, The Glen, Tumbarumba, plentiful in pasture, 4.10.1948; 1090, Holbrook, on moist roadsides, 28.9.1947; 3883, Walbundrie, common in grassland, 28.10.1949; 3500, Balldale, abundant in loose sand and gravel of roadside, 1.9.1949; 3613, Hovell Reserve, west of Burrumbuttock, abundant on dam banks, 23.9.1949; 4757, Bake's Reserve, Gerogery, margin of swamp, early fl. 13.8.1950; 2002, 14-Mile Reserve, Howlong Road, Albury, 15.9.1948; 2110, Monument Hill, Albury, in hard ground, 27.9.1948; 3661, Mungabarina Reserve, Albury, in moist gravel, mature and immature plants, 1.10.1949. Fl. Aug.-Nov.

Widespread and common, often prolific along the gravelled roadsides and barer sandy loams of the western section, avoiding peat swamps and poorly drained sites. Often present in considerable quantity in cultivation paddocks with *C. sieberiana.*

† **C. lycopodioides** *Lam.* 4832, Jindera, pot plant, 13.9.1950.

SAXIFRAGACEAE

Heuchera *L.*

† **H. sanguinea** *Engelm.* "Coral Bells". 2627, Albury, garden. Commonly cultivated.

PHILADELPHACEAE

Philadelphus *L.*

† **P. coronarius** *L.* "Mock Orange". 2634, Albury, cultivated, 21.11.1948.

Deutzia *Thunb.*

† **D. scabra** *Thunb.* 2628, 3762, Albury, garden, 21.11.1948. Commonly cultivated.

ESCALLONIACEAE

Escallonia *Mutis. ex L.f.*

† **E. rubra** (*Ruiz et Pav.*) *Pers.* 307, Woomargama, garden shrub, 16.1.1947; 4392, Albury Botanic Gardens, 22.1.1950. Cultivated.

† **E. macrantha** *Hook. et Arn.* 4393, Albury Botanic Gardens, 22.1.1950; 5371, Bungowannah, cultivated, fl. 28.11.1951.

PITTOSPORACEAE

Pittosporum *Soland. ex Gaertn.*

§ **P. undulatum** *Vent.* 3967, The Glen, Tumbarumba, cultivated, fl. and fr. 9.11.1949; 4956, Gerogery West, schoolyard, fl. 4.10.1950. Observed at homesteads at Burrumbuttock and in Albury Botanic Gardens. Not commonly cultivated.

§ **P. rhombifolium** *A. Cunn. ex Hook.* 1403, Albury, cultivated in garden, 1.2.1948; fl. at this site on 8.1.1950. Cultivated at Albury Botanic Gardens. Occasional.

Hymenosporum *F. Muell.*

§ **H. flavum** *F. Muell.* 3935, Albury Botanic Gardens, cultivated, fl. 2.11.1949; 4281, Albury Garden, fl. and early fr. 9.12.1949.

Bursaria *Cav.*

B. spinosa *Cav.* "Blackthorn". 2994, Nail Can Hill, Albury, 22.1.1949. Observed to be in early fl. at Burrumbuttock on 26.10.1949, also in Walbundrie and Rand districts on 28.10.1949; fr. seen only at East Henty on 24.2.1950. Early fl. roadsides, Balldale, 26.10.1950.

Widely distributed over the area and undoubtedly very common prior to settlement. Abundant along the banks of the Murray River from Jingellic to Bringenbrong, often forming dense scrubs; ascending to the Tumbarumba district; fairly common in parts of the forest lands at Holbrook; restricted to little-used lanes and roadways in the wheat areas.

A correspondent, Luke Gulson, travelling from Tooma to Tumbarumba, noted "a kind of wild hop bush, with small, shining, green leaves with thorny sprays ending in large bunches of seed pods the colour of leather, are quite a feature of the landscape" (*Border Post,* 26.3.1886). The reference is undoubtedly to this species.

Billardiera *Sm.*

B. scandens *Sm.* 3985, Batlow Road, Laurel Hill, not common, fr. 8.11.1949. Uncommon, probably confined to the extreme eastern portion of the area.

PLATANACEAE

Platanus *L.* "Plane Tree"

† **P. × hybrida** *Brot.* 4353, Woomargama, ornamental tree, 10.1.1950; 4356, Thurgoona, ornamental tree, 13.1.1950; 4485, Howlong, ornamental street tree, 22.2.1950. Extent of cultivation of this hybrid unknown.

HAMAMELIDACEAE

Liquidambar *L.*

† **L. styraciflua** *L.* 1058, Welaregang, 27.12.1946. Cultivated at Khancoban, Albury gardens, Upper Wantagong and many other localities.

ROSACEAE

Spiraea *L.*

† **S. thunbergii** *Siebold ex Blume.* 2515, Albury, garden shrub, 18.9.1948.

† **S. cantoniensis** *Lour.* 1216, Tumbarumba, 19.10.1947. Commonly cultivated.

† **S. × bumalda** *Burv.* (*S. albiflora × japonica*). 5735, Bungowannah, cultivated, 28.11.1951. Commonly cultivated in Albury gardens.

Cerasus *Mill.*

† **C. glandulosa** (*Thunb.*) *Loisel.* "Dwarf Flowering Cherry". 3633, 3634, Albury garden, fl. 23.9.1949. Cultivated.

Laurocerasus *M. Roem.*

† **L. lusitanica** (*L.*) *M. Roem.* "Portugal Laurel". 1040, Woomargama, garden, 8.1.1947. Commonly cultivated.

Exochorda *Lindl.*

† **E. racemosa** *Rehd.* 5732, Bungowannah, cultivated, fr., 28.11.1951.

Cotoneaster *B. Ehrh.*

† **C. franchetii** *Bois.* 1010, Holbrook, garden shrub, 7.1.1947. Commonly cultivated.

† **C.** *sp.* 2669, Albury, garden, 21.11.1948.

Pyracantha *M. Roem.*

† **P. crenulata** (*Roxb.*) *M. Roem.* 1279, Woomargama, garden, 20.12.1947.

Eriobotrya *Lindl.*

† **E. japonica** (*Thunb.*) *Lindl.* "Loquat". Cultivated for use and ornament throughout the area.

Sorbaria *A. Br.*

† **S. arborea** *Schneid.* 5820, Albury Botanic Gardens, cultivated, fl. 21.12.1951.

Photinia *Lindl.*

† **P. serrulata** *Lindl.* 1688, Table Top, ornamental tree, 21.4.1948; 3740, Albury, garden, fl. 12.10.1949.

Crataegus *L.*

† **C. monogyna** *Jacq.*, **C. oxyacanthoides** *Thuill*, and hybrids between these species, "Hawthorns", are extensively planted in the area, and are frequently used as hedges.

† **C. × lavallei** *Hérincq ex Lavallée.* 1761, Culcairn, garden shrub, 8.6.1948. Hybrid.

Raphiolepis *Lindl.*

† **R. umbellata** (*Thunb.*) *Makino* **forma ovata** (*Briot.*) *Schneid.* "Indian Hawthorn". 3939, Albury Botanic Gardens, cultivated, fl. 2.11.1949. Commonly cultivated in the Albury district.

Rubus *L.*

R. parvifolius *L.* 1307, Carboona Gap, Tumbarumba, climber on shrubs, 26.12.1947; 311, Lankey's Creek, 6.1.1947. Fl. summer.

Frequent in the Tumbarumba district and forest lands down to 1,000′ elevations, occasional elsewhere, e.g., at Horse Shoe Lagoon, Albury.

* **R. vulgaris** *Weihe et Nees.* "Blackberry". 482, Tumbarumba, 4.4.1947.

Very common along watercourses and in table-land parts of the Tumbarumba district, occasional at lower elevations, e.g., Holbrook, and Burrumbuttock.

The Tintaldra correspondent to the *Border Post* of 22.3.1889 reported that 15 years previously (i.e., about 1874) three hares, two does and a buck, were taken to Ournie Station on the Murray. They took up their abode in a thick *blackberry* hedge and were not seen for many months. This indicates that blackberry was first introduced as a hedge plant to the Upper Murray.

† **R. idaeus** *L.* "Raspberry". 1675, Albury, cultivated 16.4.1948. Also observed at Henty and Culcairn.

† **R. ursinus** *Cham. et Schlecht.* var. **loganobaccus** (*L. H. Bail.*) *L. H. Bail.* "Loganberry". Cultivated in the Tumbarumba district.

Rosa *L.*

* **R. rubiginosa** *L.* "Sweetbriar". Well established over the whole of the area reaching maximum development in the Tumbarumba and Upper Murray districts.

Long established in the Albury district as indicated by the correspondent "Thorns" to the *Border Post* of 10.8.1870. Contrasting with recent advice as to what should be cultivated, the correspondent considers plants that "should not be grown in the district." "Among the first of this latter class may be ranked the Sweet Briar, for it spreads quickly and soon overgrows good pasture land so as to render it useless. Down between Goulburn and Sydney large fields, once thickly grassed, have become densely covered with this pest . . . If any cultivator of the briar should go down Bargo and Berrima way, he will see impenetrable thickets of sweet briar covering many hundreds of acres of beautiful alluvial soil . . . I have noticed with great regret several sweet briars in a wild state already in the neighbourhood."

In the issue of 28.11.1883, the comment was advanced that "another nuisance is the sweet briar, which has taken possession of the vicinity of the Albury cemetery (to mention one spot), whence it is spreading to the common and killing the grass in the paddocks at a great rate. The residents of Adelong make loud complaints of this pest; the common there being overrun with it and in one instance a landholder had to employ labour to clear 200 acres of it at a great cost."

The Engineer's Report to the Albury Borough Council (*Border Post* 11.10.1889), stated that several contracts had been let for cutting *briars* but the contractors had abandoned their obligations. This indicates the spread in a period of 13 years in the Albury district.

Fragaria *L.*

† **F.** hybrids "Strawberry". Commonly cultivated.

Potentilla *L.*

* **P. recta** *L.* 104, Glenroy, nr. Tumbarumba, plentiful on roadsides, 3.12.1946; 5432, Wolseley Park, abundant in garden, 27.12.1950; 607, The Glen, Tumbarumba, garden weed, 24.2.1947; 310, Lankey's Creek, plentiful in old cultivation paddock, 6.1.1947. Fl. material observed at Holbrook 11.1949 and along a creek at Woomargama, mostly fr. 4.1949; Tumbarumba township, early growth, not fl. 8.11.1949. Fl. Nov.-March.

Common at localities cited but not observed outside these districts.

Kerria *DC.*

† **K. japonica** *DC.* 5745, Bungowannah, cultivated, past fl. 28.11.1951.

Aphanes *L.*

* **A. arvensis** *L.* "Parsley Piert". 1179, Holbrook, government tank, 26.10.1947; 1955, 9-Mile Reserve, Wagga Road, Albury, plentiful on grassy bank, 3.9.1948; 5025, Walbundrie, common on rocky hillside, 4.10.1950; 2004, Howlong, herb in lucerne paddock, 15.9.1948; 3715, Horse Shoe Lagoon, Albury, common on river flats, 7.10.1949; 3667, Mungabarina Reserve, Albury, common but diffuse, 1.10.1949. Recorded 3569 for Chiltern (Vic.), plentiful in forest land, 17.9.1949. Observed to be plentiful in the Tumbarumba, Laurel Hill and Batlow districts, fl. 7.11.1949; abundant fr. material in grasslands at Burrumbuttock, 27.10.1949; Bulgandry and Henty districts, 10.1949. Fl. Sept.-Nov.

Widespread and abundant in spring pastures.

Poterium *L.*

* **P. polygamum** *Waldst. et. Kit.* "Sheep's Burnet". 5331, Tumbarumba township, occasional plants in waste lands, fl. 11.11.1950; 5425, Munderoo West Creek, Wolseley Park, here and there along creek banks, 27.12.1950; 3997, 5150 The Glen, Tumbarumba, clumps on roadside, 8.11.1949, fl. 24.10.1950. 4848, Alma Park, near Culcairn, small patch along roadside drains, early fl. 23.9.1950.

Before the introduction of *Trifolium subterraneum,* this species was commonly cultivated in the Tumbarumba district. Records of cultivation of "Burnet" at Glenroy in 1906 are available, but it has since died out. No extensive attempt has been made to cultivate this species in recent years, but isolated plants still remain.

Acaena *L.*

A. ovina *A. Cunn.* "Sheep's Burr". 160, Tumbarumba, common on roadsides, 3.12.1946; 1115, Holbrook, along creek banks, 12.10.1947; 3599, Burrumbuttock, railway line, 23.9.1949; 3651 9-Mile Hill, Wagga Road, Albury, occasional, 2.10.1949; 2676, Monument Hill, Albury, 28.11.1948. Observed in early fl., Gerogery, 10.8.1949. Fl. Aug.-Nov.

Widespread, but tending to diffuse distribution in contrast with the dense clumps of *A. anserinifolia.*

A. **anserinifolia** (*Forst. et f.*) *Druce.* "Biddy-biddy". 2839, The Glen, Tumbarumba, abundant in moist pastures and along watercourses, 26.12.1948. Recorded 2724 for Indigo Falls, Leneva (Vic.), about 1,000′, 4.12.1948. Fl. spring to early summer.

A common species in gullies, swampy areas and moist shaded forests. Reaches maximum development at the higher elevations; rare or absent in heavily grazed lands and in the western portion of the area. The numerous barbed prickles on the fruit cause some irritation to the salivary glands of grazing animals.

MIMOSACEAE.

Albizia *Durazz.*

§ **A. lophantha** (*Willd.*) *Benth.* "Crested Wattle". 1849, Howlong, in garden, fl. 20.8.1948; 3720, Lavington, (N. of Albury) cultivated, fl. and fr. 5.10.1949. Occasionally cultivated.

Acacia *Mill.*

A. siculiformis *A. Cunn. ex Benth.* 2891, Murray's Crossing, Tumbarumba, on creek bank. fr. 27.12.1948. Recorded, 1264, for Walwa (Vic.), on granite, fr. 5.12.1947.

A. diffusa *Ker.* 4720, 5010, Ettamogah, 6 miles N. of Albury, single shrub in *A. armata* thicket, full fl. 19.7.1950, early fr. 2.10.1950. Recorded No. 4223, Tarcutta, common on ridges, fr. 28.11.1949. This site is some 20 miles north of the area. Distribution and incidence not known.

A. armata *R. Br.* "Kangaroo Thorn". 2010, Walbundrie, fl. 17.9.1948; 3498, Culcairn Road, Walbundrie, early fl. 1.9.1949; 1187, Jindera, plentiful on roadsides, fl. 21.10.1947; 4793, Burrumbuttock, roadsides, early fl. 25.8.1950. Fl. Aug.-Oct.

Abundant along the Howlong-Brocklesby Road and at Ettamogah (N.E. of Albury). Occurs as thickets in parts of Woomargama, on hillsides at Holbrook, on the ascent to Tumbarumba and on the Upper Murray.

A. acinacea *Lindl.* 3458, 3577, 3898, Burrumbuttock, rare in forest land, early bud 22.8.1949, fl. 19.9.1949, early fr. 28.10.1949; 3850, 4789, Brocklesby Road, Burrumbuttock, clump on roadside, early fr. 26.10.1949, full fl. 25.8.1950. Not observed outside Burrumbuttock district.

A. vomeriformis *A. Cunn. ex Benth.* 4325, Mason's Hill, Tumbarumba, not common in open forest, fr. 28.12.1949; 1969, 3432, Nail Can Hill, West Albury, fairly common, fl. and fr. 5.9.1948, early fl. 14.8.1949. Fl. Aug.-Sept. Possibly widespread in view of these diverse localities.

A. obliqua *A. Cunn. ex Benth.* 3443, Munyabla, near Henty, early fl. 15.8.1949; 3408, 3411, Brocklesby Road, 2 miles west of Burrumbuttock, fairly common on red gravel and loam soils, bud and early fl. 29.7.1949; 4764, Alma Park, fl. 15.8.1950; 4830, 2 miles N. of Jindera, roadside, fl. 20.9.1950; 4854, 5 miles N.W. of Balldale, roadsides, fl. 24.9.1950; 2093, 3543, railway embankment, Culcairn, in bushy clumps, fl. 23.9.1948, 2.9.1949; 2534, Gerogery Road, Culcairn, patch on railway line, fr. 11.11.1948. Fl. Sept.-Oct.

Distributed over the wheat areas, i.e., the western section of the area, but now restricted to railway lands, little used lanes and roads, where it forms low shrubby clumps.

A. montana *Benth.* 3231, 3444, Pleasant Hills Road, Henty, on roadsides, fr. 11.4.1949, early fl. 15.8.1949; 4241, 4742, Cemetery Reserve, Henty, fr. 9.12.1949; early fl. 4.8.1950; 2095, 2535, Culcairn Road, Henty, plentiful but isolated bushes, fl. 23.9.1948, fr. 11.11.1948; 1973, Walbundrie, isolated bushes on road, fl. 6.9.1948; 2011, Burrumbuttock Road, Walbundrie, isolated bushes up to 8′ high, 17.9.1948. Fl Aug.-Oct.

Fairly frequent and widespread in the western section of the area.

A. verniciflua *A. Cunn.* "Varnish Acacia". 5004, Talmalmo, occasional plants on roadsides, end of fl. 2.10.1950; 2006, Tunnel Road, Woomargama, on sedimentary formations, early fl. 13.9.1948; 5360, Brocklesby Road, 2 miles W. of Burrumbuttock, in little-used lane, fr. 16.11.1950; 3586, Jindera Gap, N. of Albury, fairly common on hillsides, 19.9.1949; 1935, 4817, Western (Nail Can Hill) Albury, garden hedge and in scrub land, fl. 4.9.1948, 11.9.1950; early fl. at this site on 23.7.1950, approaching full fl. 31.7.1950. Recorded 2749, for Beechworth Road, Wodonga, fr. 4.12.1948. Fl. July-Oct.

Frequent over the western half of the area but not common.

A. difformis *R. T. Bak.* 3441, Pleasant Hills and environs, forming thickets, mature fr. 15.8.1949; 3435, Culcairn Road, Alma Park, clumps along roadside, fr. 15.8.1949; 4370, 4371, Comer, 6 miles S.W. of Henty, common in little-used lanes, full fl. 17.1.1950.

Recorded for Albury district by Hurst (1942, p. 143). Common, at least in the western portion of the area.

§ **A. adunca** *A. Cunn. ex G. Don.* 3578, Burrumbuttock, cultivated, fl. 19.9.1949.

A. pycnantha *Benth.* "Hickory". 3445, 3446, Pleasant Hills Road, near Henty, scattered along roadsides, full fl. 15.8.1949; 3405, 3544, Culcairn district, occasional, in bud 28.7.1949, fl. 2.9.1949; 3409, 3410, 3864, Brocklesby Road, 2 miles west of Burrumbuttock, fairly common on red gravel and loam soils, fl. 29.7.1949, fr. 26.10.1949; 3920, Burrumbuttock, cultivated, fl. 3.11.1949. Scattered along the Balldale-Walbundrie Road, varying from a small shrub scarcely 4′ high to a medium-sized tree, in full fl. 1.9.1949. Fl. June-Nov.

Probably abundant prior to settlement, but now restricted to little-used lanes and lightly-grazed roadsides. Characterised by the bright golden blooms and the presence of galls on many plants.

A. rubida *A. Cunn.* "Red-leaved Wattle". 5146, Brae Springs, Walla Walla, rocky outcrops on hillside, fr. 17.10.1950; 3636, Lehmann's Reserve, Walla Walla, small clump, end of fl. 27.9.1948, fl. 23.8.1949; 1851A, 3489, 9-Mile Hill, Wagga Road, Albury, occasional, fl. 3.9.1949; 4524, 4800, Wymah Gap, dry hillside, uncommon, with *Eucalyptus polyanthemos* and *E. macrorhyncha,* very early bud 28.2.1950, fl. 27.8.1950. Observed at Brocklesby and reported from the Upper Murray region. Fl. Sept.-Oct.

Prefers drier sites, usually on hillsides. Not common at any of the localities cited.

A. buxifolia *A. Cunn.* 3888, Bulgandry, occasional in *Callitris* forest, early fr. 28.10.1949; 5412, Mundawadra, 10 miles N.W. of Henty, on roadside, fr. 11.12.1950; 3433, 3905, Albury, cultivated, fl. 14.8.1949, full fl. 26.8.1951, early fr. 31.10.1949. Recorded for Tarcutta, north of the area, common on ridges, fr. 28.11.1949.

§ **A. cyanophylla** *Lindl.* 5093, Jindera, cultivated ornamental tree, early fl. 10.10.1950.

A. hakeoides *A. Cunn. ex Benth.* 3468, Rand-Goombargana Stock Route, single tree, bud to early fl. 22.8.1949. Not observed elsewhere.

A. decora *Reichb.* 3580, 3892, Burrumbuttock, possibly cultivated, fl. 19.9.1949, early fr. 28.10.1949; 4745, Jindera, in avenue, bud only 9.8.1950. Recorded, 4229, Hume Highway between Tarcutta and Gundagai, north of the area, common, fr. 28.11.1949.

§ **A. podalyriifolia** *A. Cunn. ex G. Don.* "Queensland Silver Wattle". 2018, 3459, Walbundrie Road, Burrumbuttock, fl. 17.9.1948, 22.8.1949; 1852A, 2498, Albury, garden, fl. 4.9.1948, fr. 7.11.1948; early fl. Albury garden on 6.7.1950, full bloom 31.7.1950; 4663, Burrumbuttock, cultivated, early fl. 26.6.1950. Fl. July-Oct.

Commonly cultivated.

A. kettlewelliae *Maiden.* 2861, 4012, Tumbarumba Road, Laurel Hill, common along road (8 miles), 2,000′-3,000′, fr. 27.12.1948, end of fl. 8.11.1949; 5440, Paddy's River, Tooma, in forest lands, fr. 26.12.1950; 2895, Murray's Crossing, Tumbarumba, fairly common on creek banks, and around township, fr. 27.12.1948.

A montane species, frequent in the Tumbarumba district and township, over 2,000′ elevation.

A. linearifolia *A. Cunn.* (*A. adunca* sensu Maiden non A. Cunn.). Recorded for The Rock and Corowa by Maiden and Blakely (1926, p. 177); 3483, Thornhill Park schoolyard, Walbundrie, ornamental tree, fl. 29.8.1949.

A. pravissima *F. Muell.* 3826, 4203, Jindera, garden, early fr. 18.10.1949, fr. 5.12.1949. Recorded, 2079, Indigo Falls, Leneva (Vic.) about 16 miles S. of Albury, fl. 26.9.1948. Reported from the Upper Murray (R. T. Morland, p.c.).

A. pendula *A. Cunn. ex G. Don.* "Boree". 4472, Lockhart Road, 5 miles N.W. of Rand, rare, 9.2.1950; 3382, Burrumbuttock, cultivated at homestead, end of fr. 27.6.1949.

Confined to the extreme western portion of the area. Occasionally cultivated.

A. melanoxylon *R. Br.* "Blackwood". 5417, Munderoo West Creek, Wolseley Park, common along creek banks, fr. 27.12.1950; 1131, Boggy Creek, Tumbarumba, fairly plentiful in forest land, fl. 3.10.1947. Recorded, 2076, Indigo Falls, Leneva (Vic.), about 1,000′, plentiful along creek, fl. 26.9.1948.

Plentiful in the Tumbarumba district, rare or absent in areas under 1,000′; occurring also in parts of the Upper Murray Valley (R. T. Morland, p.c.), and at

Upper Wantagong (J. Henderson, p.c.), also at Lankey's Creek and Coppabella Creek, Jingellic. Prefers the higher elevations, and its distribution is on the foothills ascending to the tablelands.

Presumably the species referred to by Hodgkinson in a report to the Surveyor General of Victoria on the Murray Basin (1856): "Blackwood, which is, however, a rare tree in the basin of the Murray, is very durable, and its contraction small" (*Border Post,* 20.6.1857).

A. implexa *Benth.* "Hickory". 3107, Brocklesby, sparingly distributed, fl. and fr. 21.2.1949; 5363, Brocklesby Road, Burrumbuttock, in little-used lane, fr. 16.11.1950; 3330, 9-Mile Hill, Wagga Road, Albury, early fl. 7.6.1949; 3031, Budgi Trig. Stn. Hill, Table Top, fairly common on hillside, fl. and fr. 27.1.1949. Observed on roadside at Walla Walla, full fl. 8.5.1950. Fl. irregular, at least summer and autumn.

Of diffuse distribution over the western section of the area but nowhere common.

§ **A. sophorae** (*Labill*) *R. Br.* 5068, Thurgoona, near Albury, successfully cultivated, fl. and early fr. 10.10.1950.

A. doratoxylon *A. Cunn.* 3581, 3893, Burrumbuttock, cultivated, probably from local seed, early fl. 19.9.1949, fl. 28.10.1949. Recorded for Chiltern (Vic.) by Ewart (1930, p. 605).

§ **A. glaucescens** *Willd.* "Myall". 3794, Burrumbuttock, cultivated, fl. 14.10.1949. Uncommon.

§ **A. spectabilis** *A. Cunn ex Benth.* 3579, 3981, Burrumbuttock, cultivated, fl. 19.9.1949, early fr. 28.10.1949.

A. dealbata *Link.* "Silver Wattle". 2879, The Glen, Tumbarumba, plentiful throughout district, fr. 29.12.1948; 3456, Yarara Gap, Wantagong, full bloom, 22.8.1949; 2007, 2494, Tunnel Road, Woomargama, plentiful, fl. 13.9.1948, fr. 6.11.1948; 3463, Billabong Creek, Rand, along creek banks, fl. 22.8.1949; 3912, Billabong Creek, Culcairn, fr. 31.10.1949. Fl. Aug.-Nov., the latter at higher elevations, 2,000′ to 3,000′.

Plentiful throughout the area. Very common around Albury. This species is responsible for the brilliant, golden coloration of whole hillsides and gullies in early spring, especially in open forest lands at Carabost, Lankey's Creek, Rosewood, Wymah and Albury.

§ **A. decurrens** (*Wendl*) *Willd.* "Black Wattle". 2062, Walbundrie Road, Burrumbuttock, cultivated, fl. 20.9.1948; 2764, 3919, Burrumbuttock, cultivated, fr. 3.12.1948, fl. 3.11.1949.

Frequently cultivated around homesteads in the Albury district.

‖ **A. baileyana** *F. Muell.* 2499, Albury, garden, fr. 7.11.1948. Fl. July-Sept.

Very commonly cultivated throughout the area and spontaneous in some localities.

A. deanei (*R. T. Bak.*) *Welch, Coombs et McGlynn.* 4853, 5 miles N.W. of Balldale, clumps on roadside, fl. and fr. 24.9.1950; 3484, Thornhill Park-Rand Road, small clumps on roadside, fl. 29.8.1949 (fl. at same locality on 12.1.1950); 4499, East Henty, small tree on roadside, fl. 24.2.1950; fl. at this site on 22.6.1949; 5535, Walbundrie roadsides, fr. 18.9.1950. Fl. irregular at various times throughout the year.

Occasional either as small trees or isolated shrubs in Henty, Walbundrie, Brocklesby and Balldale districts. Common about the Pleasant Hills township. The yellow-green foliage is a noticeable field characteristic.

§ **A. cardiophylla** *A. Cunn. ex Benth.* 3453, 3827, Jindera, cultivated, bud only 18.8.1949, early fr. 18.10.1949.

A. *spp.* The following species are listed by local nurserymen. § *A. elata,* A. Cunn. ex Benth.), § *A. longifolia* (Andr.) Willd.

CAESALPINIACEAE

Cercis *L.*

† **C. siliquastrum** *L.* "Judas Tree". 2632, Albury, garden, fr. 21.11.1948. Cultivated Albury Botanic Gardens. Occasional.

Ceratonia *L.*

† **C. siliqua** *L.* "Carob Bean". 1019, Mountain Creek, Holbrook, cultivated but never sets fruits, 27.4.1947; 3397, Monument Hill, Albury, in arboretum, fl. 23.7.1949. Excellent specimens for ornamental use observed in the Burrumbuttock and Tumbarumba districts. Commonly cultivated.

Cultivated as early as 1874 since it is recorded that twelve plants of "*ceratonia siliqua,* the Locust Plant, may be inspected at the Ettamogah vineyard. The seeds were sent by Baron Mueller, and the plants are five feet high" (*Border Post,* 7.3.1874).

Cassia *L.*

‖ **C. sophera** *L.* 3024, 3075, Culcairn, free growth and spontaneous on railway line, early fl. 25.1.1949, fl. and fr. 15.2.1949; abundant fl. and fr. at this site on 24.2.1950. Along the Great Southern Railway Line from Gerogery to Yerong Creek.

§ **C. corymbosa** *Lam.* 683, Holbrook, garden shrub, fl. 2.9.1947; 3883, Burrumbuttock, cultivated, full fl. 27.6.1949; 3030, Table Top, garden, fl. and fr. 27.1.1949. Commonly cultivated.

§ **C. eremophila** *A. Cunn. ex T. Vogel.* 3016, East Henty, garden, fr. 25.1.1949.

Gleditsia *L.*

† **G. triacanthos** *L.* "Honey Locust". 2592, Albury Saleyards, early fl. 10.11.1948; 3937, Albury Botanic Gardens, large tree, early fl. 2.11.1949. Observed in the Tumbarumba district. Occasionally cultivated in the Albury district.

Poinciana *L.*

† **P. gilliesii** *Hook.* "Bird-of-Paradise Tree". 3115, Rand, garden, fl. and fr. 25.2.1949; 726, Holbrook, garden, fl. and fr. 7.3.1947. Not uncommon in Albury gardens and widely cultivated. Several cultivators have commented on the explosive opening of the mature pods with consequent ejection of the seeds for several yards, e.g., on to roof-tops.

LEGUMINOSAE

Virgilia *Lam.*

† **V. croboides** (*Berg.*) *Salter.* Cultivated at Upper Wantagong, (Miss J. Henderson, p.c.).

Gompholobium *Sm.*

G. huegelii *Benth.* 4002, Laurel Hill, open forest land, in bud, 9.11.1949; 4332, Mason's Hill, Tumbarumba, fairly common in open bush, fl. and fr. 28.12.1949; 5196, Railway Reserve, Tumbarumba, scrub land, fl. 26.10.1950; 5757, Wymah Gap, Wymah, occasional plants on face of road cutting, mainly fr. 29.11.1951.

Observed only in these montane areas.

Oxylobium *Andr.*

O. ellipticum *R. Br.* var. **alpinum** *Maiden et Betche.* Recorded for Laurel Hill by Cambage (1904).

Mirbelia *Sm.*

M. oxylobioides *F. Muell.* 2894, Murray's Crossing, Tumbarumba, on creek banks, fr. 27.12.1948; 5224, Adelong Road, Tumbarumba, abundant along creek banks, early fl. 26.10.1950; 5441, Paddy's River, Tooma, creek banks, fr. 26.12.1950; 5464, Munderoo West Creek, Wolseley Park, creek banks, fr. 27.12.1950. Recorded for Tallangatta Valley (Vic.) by Nicholls (1931, p. 146). Fl. Oct.-Dec. Common along watercourses in Tumbarumba and Upper Murray Valley districts.

Daviesia *Sm.*

D. latifolia *R. Br.* 1120, Carboona Gap, Tumbarumba, road embankment, fl. 6.10.1947; 1964, Nail Can Hill, Albury, fl. 5.9.1948; 2524, 3414, Monument Hill, Albury, common shrub, fr. 7.11.1948, early fl. 7.8.1949. Observed fl. along Jindera-Burrumbuttock Road on 14.10.1949; abundant along Tumbarumba-Laurel Hill-Batlow Road, end of fl. 7.11.1949. Fl. Aug.-Nov.

Widespread and common in many localities.

D. linearis *Lodd.* 448, Carabost State Forest, fr. 29.12.1946. Not observed elsewhere in the area.

D. ulicina *Sm.* 4015, Tumbarumba-Laurel Hill Road, occasional bushes, fl. 8.11.1949. Recorded for Laurel Hill by Cambage (1904).

D. genistifolia *A. Cunn.* 3896, Burrumbuttock, rare in open forest land, fr. 28.10.1949; 3541, 3709, railway enclosure, 5 miles S. of Culcairn, uncommon, early fl. 2.9.1949, fl. and early fr. 3.10.1949. Only localities noted.

Pultenaea *Sm.*

P. styphelioides *A. Cunn.* var. **styphelioides.** 2493, 4984, Tunnel Road, Woomargama, on sedimentary formations, fl. 6.11.1948, early fl. 2.10.1950. Observed to be fairly common on Monument Hill, Albury, early fl. 12.10.1949; 5379, Mullengandra, open forest land, mostly fr. 27.11.1950. Recorded as abundant at Mittamitite near Corryong (Vic.) by Williamson (1929, p. 259) and for Chiltern by Ewart (1930, p. 360).

Var. **mutica** *F. Muell.* Recorded as thicket on Howlong Road, Chiltern (Vic.) by Williamson (1929, p. 259) and for Chiltern and Beechworth by Ewart (1930, p. 360).

P. foliolosa *A. Cunn.* 2511, 2762, Monument Hill, Albury, plentiful, fl. 7.11.1948, fr. 5.12.1948.

P. forsythiana *Blakely.* Type recorded for Lobb's Hole, W. Forsyth, 11.1900 by Blakely (1941, p. 122).

P. mucronata *F. Muell.* Recorded for Laurel Hill by Cambage (1904), and by Hamilton (1901) as "recently collected at Tumbarumba by Forsyth".

P. juniperina *Labill.* Recorded for the adjacent Pine Mount (N.E. Vict.), by Williamson (1921, p. 139).

P. vrolandii *Maiden.* Recorded for Pine Mount (N.E. Vic.), by Williamson (1921, p. 144).

P. daphnoides *Wendl.* var. **parviflora** *H. B. Williamson.* Recorded for Upper Murray district by Williamson (1920, p. 212).

Eutaxia *R. Br.*

E. empetrifolia *Schlecht.* 4883, 4 miles N. of Henty, occasional on roadside, fl. 22.9.1950; 4847, 5669, Alma Park, prostrate masses to 3′ diameter on roadsides, full fl. 23.9.1950, fr. 6.11.1951; 3539, 3685, Cemetery Reserve, Henty, on red loam and shale, early fl. 2.9.1949, fl. 3.10.1949. Observed on roadsides at Alma Park near Culcairn.

Uncommon; occasional shrubs occur in the wheat areas.

Dillwynia *Sm.*

D. ericifolia *Sm.* var. **phylicoides** (*A. Cunn.*) *Benth.* 5199, Railway Reserve, Tumbarumba, scrub land, fl. 26.10.1950; 1249, 2005, 2496, Tunnel Road, Woomargama, on red granite soil intermixed with schist and slate, fr. 26.11.1947, fl. 13.9.1948, fr. 6.11.1948. Common at these sites but not observed elsewhere.

D. sericea *A. Cunn.* 3699, 4649, Cemetery Reserve, Henty, large clump, fl. 3.10.1949, early fl. 9.6.1950; 4851, Alma Park, on roadsides, fl. 23.9.1950; 3677, 3682, Jindera Gap, 6 miles N. of Albury, isolated shrubs on ridges, fl. 2.10.1949; 2099, 2512, Monument Hill, Albury, common, fl. 27.9.1948, fr. 7.11.1948. Recorded for Albury by Blakely (1939, p. 184). Fl. Aug.-Oct., occasionally as early as June.

Widespread and fairly common and observed at numerous localities.

Platylobium *Sm.*

P. formosum *Sm.* 1128, Carboona Gap, Tumbarumba, on road embankment, 3.10.1947; 3988, Laurel Hill, roadsides, early fr. 8.11.1949; 2589, Monument Hill, Albury, plentiful, fl. and fr. 18.9.1948. Recorded, 2074, for Indigo Falls, Leneva (Vic.), fairly common on hillsides, 26.9.1948. Occasional flowers observed in Beechworth district (N.E. Vic.) on 25.6.1950. Fl. mainly Oct.-Nov., but as early as June.

Widely spread and not rare, on hillsides and heathlands.

Hovea *R. Br.*

H. heterophylla *A. Cunn. ex Hook. f.* 4330, Mason's Hill, Tumbarumba, open forest, fr. 28.12.1949; 1831, 2028, 2751, 3335, Monument Hill, Albury, semi-climbing, plentiful, early fl. 10.7.1948, early fr. 18.9.1948, mature fr. 5.12.1948, early fl. but scarce, 18.6.1949. Fl. June-Oct. but intermittent.

Common at localities cited and probably widespread.

Templetonia *R. Br.*

T. stenophylla (*F. Muell.*) *J. M. Black.* 5374, Alma Park, near Culcairn, uncommon in cemetery, mainly fr. 18.10.1950; 3615, P.W.P. Tank, Burrumbuttock, not common, fl. and fr. 23.9.1949. Not observed elsewhere.

Goodia *Salisb.*

G. lotifolia *Salisb.* "Golden Tip". 162, Carabost Road, Little Billabong, patch in open forest, mainly fr. 8.12.1946. Uncommon, occasionally cultivated.

Ulex *L.*

* **U. europaeus** *L.* "Gorse". 1972, Burrumbuttock, single plant on roadside, fl. and early fr. 6.9.1948. Distributed along the Jindera-Bungowannah Road; patches occur between Walbundrie and Rand, isolated plants in the Howlong area. At these localities it has little tendency to spread. Fl. irregular—most of the year.

Once cultivated as a hedge until suppressed on account of potential noxious qualities. Abundant in the montane areas of the adjacent N.E. Victoria, e.g., Beechworth to Stanley (2,000′-2,500′).

Laburnum *Griseb.*

† **L. anagyroides** *Medic.* 3822, 4204, Jindera, garden, fl. 18.10.1949, fr. 5.12.1949; 5738, Bungowannah, cultivated, end of fl. early fr. 28.11.1951.

Chamaecytisus *Link*

* **C. prolifer** (*L.f.*) *Link.* "Tagasaste", "Tree Lucerne". 2647, 3903, Albury, cultivated and spontaneous in garden, fr. 22.11.1948, fr. 31.10.1949. Early blooms in Howlong and Albury districts on 26.8.1949 and 26.5.1950; full bloom 13.9.1949, end of fl. 17.10.1949. Fl. mainly Aug.-Oct., sometimes as early as July. Widespread and commonly cultivated; spontaneous in many areas.

Sarothamnus *Wimm.*

† **S. scoparius** (*L.*) *Wimm.* 5740, 5751, Bungowannah, cultivated 28.11.1951.

Genista *L.*

* **G. candicans** *Jusl.* 2653, Gerogery, natural regeneration on roadside, 24.11.1948; 5040, Jindera Road, Gerogery, large clump, 6.10.1950; 1211, Howlong Road, Albury, 16.10.1947.

Naturalised in various parts of the area.

† **G. maderensis** (*Webb. et Berth.*) *Lowe.* 3849, Albury Botanic gardens, cultivated, full fl. 24.10.1949.

Medicago *L.*

* **M. sativa** *L.* "Lucerne". 2683, 3008, Albury, garden, fl. 28.11.1948, fr. 22.1.1949. Commonly cultivated especially on the richer alluvial river flats, spontaneous in cultivated lands, gardens and along railway lines.

* **M. tribuloides** *Desr.* "Barrel Medic". 2542, Henty, sparingly distributed on railway line, fr. 11.11.1948; 3875, Walbundrie, common in lane between cultivation paddocks, 28.10.1949; 3597, 3598, Burrumbuttock, not common along railway line, mostly fl. and early fr. 23.9.1949.

Widespread at least in the wheat areas.

* **M. denticulata** *Willd.* "Burr Medic". 1130, Munderoo, via Tumbarumba, fl. and early fr. 5.10.1947; 3128, Pleasant Hills road, Henty, scarce in moist culvert, fr. 1.3.1949; 3696, Cemetery Reserve, Henty, fairly common in pasture, fl. and early fr. 3.10.1949; 3296, Culcairn, garden, fl. and fr. 9.5.1949; 3609, Burrumbuttock, railway line, 23.9.1949; 2003, Howlong, in lucerne paddock, fl. 15.9.1948; 1676, Cumberoona Reserve, Bowna, fl. and fr. 18.4.1948; 2443, 2444, Albury, garden, 31.10.1948. Fl. Aug.-May, but mainly spring and summer.

In pastures, cultivated lands and gardens. Its abundance may be gauged by the large numbers of burrs carried in sheep fleeces in summer.

* **M. praecox** *DC.* 2059, 3781, Bulgandry Reserve, Bulgandry, common in loose soil under trees, fl. and fr. 20.9.1948, 14.10.1949; 3687, Cemetery Reserve, Henty, occasional in grassland, fl. and fr. 3.10.1949. Not noted elsewhere.

***M. arabica** (*L.*) *Huds.* "Spotted Medic". 1126, Munderoo, Tumbarumba, luxuriant in pastures, sheepyards and waste lands, fl. and early fr. 5.10.1947; 3260, The Glen, Tumbarumba, young growth abundant, rare fl. and fr. 25.4.1949; 2439, Albury, common in garden, 31.10.1948. Fl. Sept.-Dec., until May in sheltered sites.

Widespread in pastures, gardens and cultivated lands.

***M. minima** (*L.*) *Bartal.* "Small Woolly Burr Medic". 164, Holbrook, pasture, fl. and fr. 10.12.1946; recorded for Holbrook by Breakwell (1917, p. 523); 3790, Rand, sheltered position in grassland, full fr. 14.10.1949; 4909, Pleasant Hills, abundant on roadsides, fl. and early fr. 22.9.1950; 4947, Stock Reserve, Goombargana, grassland, 25.9.1950; 3477, 4781, Bulgandry Reserve, Bulgandry, occasional in pasture, early fl. 29.8.1949; fl. and early fr. 21.8.1950; 3697, Cemetery Reserve, Henty, diffuse in pasture, fl. and fr. 3.10.1949. Fl. Aug.-Dec.

Widely spread and common in the wheat belt.

***M. laciniata** *Mill.* "Cutleaved Medic". 4788, Billabong Creek, Rand, uncommon in grey loam of creek banks, fl. 21.8.1950.

Melilotus *Mill.*

***M. indica** (*L.*) *All.* "Hexham Scent". Recorded for Wahgunyah, Murray River, 11.9.1919, west of the area by Ewart and Tovey (1920, p. 209) as *M. parviflora* Desf., and specimens have been seen from parts of the adjacent N.E. Victoria, but not observed within the area itself.

†**M. alba** *Medic.* "Bokhara Clover". Experimental sowings have been reported.

Trifolium *L.*

***T. campestre** *Schreb.* "Hop Clover". 3803, Bulgandry, in pasture, 17.10.1949; 165, Holbrook, in pasture, 18.12.1946; 3852, Burrumbuttock, abundant on roadsides, 26.10.1949; 3870, Bungowannah, in grassland, 26.10.1949; 3941, Albury Botanic Gardens, margins of flower beds, 2.11.1949; 4290, The Glen Tumbarumba, garden weed, 26.12.1949. Fl. spring and summer, with a wide latitude in favoured and sheltered sites.

***T. dubium** *Sibth.* "Yellow Suckling Clover". 2131, 3255, The Glen, Tumbarumba, common, 4.10.1948, fl. in moist spots only on 24.4.1949; 3263, Munderoo Creek, Mannus, fl. material scarce, 24.4.1949; 2441, Albury garden, 31.10.1948; 3205, Mungabarina Reserve, Albury, sheltered positions along creek banks, fl. 3.4.1949. Fl. most of the year.

Very widespread and present in most grasslands. A reference in the *Border Post* of 10.10.1866 to "Colonial Trefoil" probably refers to this species. It "abounds in all localities, especially those occupied by stock for any length of time. Cows and bullocks gorge themselves with the plant, especially when the dew renders it more or less succulent. Several head of cattle have been lost. The trefoil has a small yellow flower, and is thereby distinguished from the English Clover with large flowers of white and pink. We don't suppose that the English clover is detrimental to cattle; indeed the finest bullocks we have ever seen in Albury, were some young stock fed in the clover paddocks at Copabella."

***T. tomentosum** *L.* "Woolly Clover". 3791, Rand, roadsides, 14.10.1949; 3798, Bulgandry, plentiful in moist spots, 14.10.1949; 3704, Henty, roadsides, 3.10.1949; 1240, Holbrook, 26.10.1947; 3873, Bungowannah, moist in spots in pasture, 26.10.1949; 3746, Monument Hill, Albury, dwarf forms in sandy silt, 12.10.1949. Fl. Oct.-Nov.

Widespread but not common, preferring moister areas with less grazing.

***T. repens** *L.* "White Clover". 3259, The Glen, Tumbarumba, 25.4.1949; 2521, 2522, Albury Saleyards, 7.11.1948; 3659, Mungabarina Reserve, Albury, early fl. 1.10.1949. Fl. Sept.-April, but in occasional places during most of the year.

Adventive and well established in most grasslands of higher fertility and greater moisture, e.g., river flats; fairly common in grasslands over 2,000′ elevations. Established in the area as early as 1857; Mr. McLaren at his station on the Mitta Mitta had "a splendid crop of Dutch clover and English rye-grass" (*Border Post,* 7.3.1857).

The Tintaldra correspondent to the *Border Post* of 7.5.1889 found that after the recent heavy rains the response at Towong and Brigenbrong of recently sown "English grasses together with *white clover*" was noticeable. The English grasses were probably *Lolium* spp. or *Dactylis glomerata.* On the Kergunyah Estate near Wodonga, advertised for sale on 18.4.1890, the rich alluvial flats were "heavily grassed with rye-grass and clover". The latter was probably this species.

***T. cernuum** *Brot.* 3250, The Glen, Tumbarumba, fl. in shaded localities only 25.4.1949; 3607, Burrumbuttock, railway line, 23.9.1949; 2552, Table Top, pastures, 10.11.1948; 2529, Albury Saleyards, swampy area, 7.11.1948; 3203, 3660, Mungabarina Reserve, Albury, 3.4.1949, 1.10.1949. Observed fl. in swamps at Wymah Gap on 28.2.1950. Fl. mainly spring and summer, otherwise for most of the year.

Abundant in moister areas and widespread.

***T. glomeratum** *L.* "Clustered Clover". 3793, Fagan's Reserve, Walbundrie, abundant, 14.10.1949; 4287, The Glen, Tumbarumba, garden weed, mainly fr. 26.12.1949; 3698, Cemetery Reserve, Henty, early fl. 3.10.1949; 2445, 3719, 3752, Albury, common, 31.10.1948, 7.10.1949, 12.10.1949. Fl. spring and summer, or as early as July.

Well established in most grasslands and a common weed in many gardens throughout the area.

***T. fragiferum** *L.* "Strawberry Clover". 4486, Lavington, 2 miles N. of Albury, cultivated land, early fl. and fr. 23.2.1950. Specimens have been seen from the Howlong district. Incidence not known.

***T. scabrum** *L.* "Rough Clover". 5089, 5368, Ryan, near Henty, roadside drains, fl. 13.10.1950, mostly mature 21.11.1950.

***T. striatum** *L.* "Knotted Clover". 5327, Tumbarumba township, in street gutters, fl. 11.11.1950; 2537, Henty, railway enclosure, 11.11.1948; 2610, 2787, Walla Walla, plentiful on roadsides, 17.11.1948; 2568, Corowa Road, Howlong, common in moist roadside drains, 17.11.1948; 3871, Bungowannah, moist spots in marshy areas, early fr. 26.10.1949; 3923, Table Top, common on road embankment, fl. 4.11.1949. Recorded 3979, Adelong, outside of area, abundant on roadsides, 8.11.1949. Observed to be common on roadsides in the Tumbarumba district approaching full fl. 7.11.1949. Fl. Oct.-Nov.

Well established in the wheat areas, otherwise widely spread.

***T. arvense** *L.* "Haresfoot Clover". 3604, Burrumbuttock, railway line, 23.9.1949; 3417, Monument Hill, Albury, small patch in sheltered locality, fl. 7.8.1949; 4545, Albury Cemetery, regrowth after rain, 25.2.1950. Fl. spring and summer, but some material can be seen at most times of the year. Very widespread and common. In pastures, cultivation and open forest lands; often dominant in fallow lands and poorer soils.

***T. angustifolium** *L.* "Narrow-leaved Clover". 4338, Tumbarumba, township, patch on roadside, mainly fr. 28.12.1949; 5381, Jingellic, common on roadsides, 26.11.1950; 1221, 2612, Walla Walla, 30.10.1947, 17.11.1948; 2464, Gerogery, scattered in pasture, 1.11.1948; 2442, Albury, garden, 31.10.1948. Fl. Oct.-Jan., the dead seed-heads persisting till the late autumn.

Common in the wheat areas, both in grasslands and cultivation, sparingly distributed in the eastern section.

* **T. subterraneum** *L.* "Subterranean Clover". 1213, The Glen, Tumbarumba, 18.10.1947; 1999, 14-Mile Reserve, Howlong, early fl. 15.9.1948; 2440, Albury, garden, 31.10.1948. Fl. Aug.-Dec.

Extensively cultivated and now adventive in most grasslands in the area. Particularly luxuriant in the Tumbarumba district, e.g., Rosewood, Wolseley Park and Mannus, dominating other herbage in winter and spring. Its phenomenal development is indicated by a note (Whittet, 1928, 377) that the manager of Munderoo Station reports that "250 acres of subterranean clover has been established and shows every indication of being a success." Recorded by Breakwell (1923, pp. 305-6) as "growing wild in pastures in the southern districts, particularly Holbrook . . . At Holbrook also, in the ordinary pastures, the clover is obtaining a good spread and gradually crowding out other grasses". Within two decades, the prolific clover pastures have been incriminated in the aetiology of Toxaemic Jaundice and infertility in sheep.

* **T. hirtum** *All.* 3783, Bulgandry Reserve, Bulgandry, uncommon in pasture, 14.10.1949. Not observed elsewhere.

Lotus *L.*

L. australis *Andr.* 3073, Culcairn, railway enclosure, fl. 15.2.1949; 2609, 2619, 2789, 2790, Bell's Road, Gerogery, small patch on railway line, fl. 17.11.1948, fr. 16.12.1948; 5670, Alma Park, roadside, fl. 6.11.1951. Observed along railway line, 4 miles N. of Burrumbuttock. Observed only at these localities.

* **L. corniculatus** *L.* and var. 5468, Tumbarumba, volunteer around ornamental garden pond, 24.12.1950; 3056, Wolseley Park, adventive in swamps, fl. and fr. 3.2.1949; 2775, 23-Mile Reserve, Mullengandra, uncommon in creek beds, fl. 10.12.1948. Uncommon and localised.

† **L.** sp. A species known as "Lotus Major" has been sown in swamps in parts of the Upper Murray and was observed to be doing well at Khancoban.

Trigonella *L.*

* **T. ornithopodioides** (*L.*) *DC.* 5696, Wallandool Reserve, near Urangeline, large patch in moist clay of swampy depression, fl. and fr. 12.11.1951; 5675, Cemetery Reserve, Henty, in moist clay near inflow to stock tank, fl. and fr. 9.11.1951; 4270, Waterworks Reserve, Albury, mixed with tall herbage of dried out "gilgai" in company with *Marsilea* and *Amphibromus*, not plentiful, fl. and fr. 15.12.1949.

The observed localities suggest dissemination by travelling stock.

Indigofera *L.*

I. australis *Willd.* "Australian Indigo". 3987, Laurel Hill, occasional in forest lands, fl. 8.11.1949; 5197, Tumbarumba, in railway reserve scrub land, early fl. 26.10.1950; 3854, Brocklesby Road, Burrumbuttock, uncommon in scrub, end of fl. 26.10.1949; 3587, 3675, Jindera Gap, N. of Albury, isolated bushes, fl. and early fr. 19.9.1949, 2.10.1949; 1957, Nail Can Hill, West Albury, occasional, early fl. 5.9.1948. Fl. Sept.-Nov.

Widely spread in forest and heathlands, but never common. Observed in the Woomargama, Tumbarumba and Holbrook districts; rare or extinct in the wheat areas.

Var. **signata** *F. Muell. ex Benth.* 5769, Wymah Gap, Wymah, single shrub on road embankment, fl. and fr. 29.11.1951.

† **I. incarnata** (*Willd.*) *Nakai.* 1401, Albury, garden, fl. and fr. 1.2.1948.

Robinia *L.*

† **R. pseudoacacia** *L.* "False Acacia". 3969, The Glen, Tumbarumba, cultivated in avenue, full fl. 9.11.1949. Early fl. in Albury streets on 10.1949. Fl. Oct.-Dec.

Commonly cultivated for street trees, shelter belts, homesteads and stock yards but troublesome on account of its sucker growth.

"Traveller" in discussing the settlement of Moorwatha near Howlong (*Border Post,* 24.1.1880) notes: "The country has a very dry appearance, all flat with principally stunted box timber. *Acacia* hedges are becoming very prevalent, and will be found a great nuisance in future to farmers. These trees I understand, are fine conductors of fire, and may exhaust a great deal of land, spreading as they do". Referring to this locality, the same correspondent observes the "remarkably high and thick hedges of prickly pear, acacia and furze and they confine the roads in many places into dreary lanes" (*Border Post,* 11.9.1880).

Daubentonia *DC.*

† **D. tripetii** *Poit.* 5811, 5825, Culcairn, cultivated as garden shrub, fl. 16.12.1951, fl. and fr. 16.1.1952.

Swainsona *Salisb.*

S. phacoides *Benth.* ssp. **phacoides.** Recorded for Tooma Rapids, Campbell, by Lee (1948, p. 176).

S. oroboides *F. Muell. ex Benth.* ssp. **sericea** *A. Lee.* Recorded by Lee (1948, p. 202), at Albury, Patterson, 10.1916; do., Beattie; plains near Culcairn, Forsyth, 11.1900; Albury, Fellowes 11.1905.

Ssp. **reticulata** (*J. M. Black*) *A. Lee.* Recorded for Murray River, below Albury, C. French Jnr., 10.1884, by Lee (1948, p. 200).

S. murrayana (*Wawra*) *A. Lee* ssp. **eciliata** *A. Lee.* Recorded for Tooma Rapids, Campbell, by Lee (1948, p. 221).

S. procumbens (*F. Muell.*) *F. Muell.* Recorded for Albury, Bartlett, 9.10.1936, by Lee (1948, p. 228).

S. recta *A. Lee.* Recorded for Culcairn, Dwyer, 29.9.1930, by Lee (1948, p. 251).

S. swainsonioides (*Benth.*) *A. Lee.* 3824, Walbundrie, roadside, fl. 17.10.1949; 4240, Cemetery Reserve, Henty, margin of swamp, fl. and fr. 9.12.1949, fl. 24.2.1950. Abundant fl. material observed along roadsides in Walbundrie, Walla Walla and Brocklesby districts 20-22.9.1950.

Widespread, at least in the western half of the area, tending to diffuse distribution rather than clumps. Occasional plants can be seen along miles of roadways in the wheat areas.

Desmodium *Desv.*

D. varians (*Labill.*) *G. Don.* 2883, 2844, The Glen, Tumbarumba, common in forest land, mainly fr. 28.12.1948, 25.12.1948; 163, Culcairn Road, Ralvona, fl. and fr. 21.12.1946; 4368, Walla Walla-Gerogery Road, in tall herbage of roadside, occasional fl. and fr. 9.1.1950; 2728, 3292, Monument Hill, Albury, not common, fl. and fr. 5.12.1948, 8.5.1949. Fl. Nov.-May but intermittent.

Diffuse over most of the area. Chiefly in forest lands, scrub lands and lands sheltered from grazing.

Vicia *L.*

* **V. sativa** *L.* "Common Vetch". 1137, Table Top, fl. 9.10.1947; 1990, 2636, Monument Hill, Albury, widespread in gardens, 12.9.1948, 21.11.1948. Recorded, 2077, Indigo Falls, Leneva (Vic.), common along creek banks, fl. 26.9.1948. Fl. Sept.-Dec., but a small proportion at various times during the year.

Widely spread in gardens, pastures and cultivated lands.

* **V. angustifolia** *L.* 3316, East Henty, roadside, sheltered drain, fl. and fr. 27.5.1949; 3917, 5646, Gerogery, railway line, abundant on embankments, 31.10.1949, 28.10.1951. Recorded, 2719, for Indigo Falls, Leneva (Vic.), fl. 4.12.1948.

* **V. hirsuta** (*L.*) *S. F. Gray.* 2828, Murray's Crossing, Tumbarumba, not plentiful, mostly fr. 27.12.1948; 2630, Albury, garden weed, fl. and fr. 21.11.1948.

Probably widespread in view of the diverse localities cited.

Kennedia *Vent.*

K. prostrata *R. Br.* 3269, 3945, Table Top, isolated plants along railway line, end. of fr. 24.4.1949; fl. and fr. 4.11.1949. Not observed elsewhere.

Hardenbergia *Benth.*

H. violacea (*Schneev.*) *Stearn.* "False Sarsaparilla". 1854A, Western Hill, Albury, common, fl. 4.9.1948; early fl. Monument Hill, Albury on 6.7.1950. Recorded, Ebden (Vic.), on railway embankment, early fl. 9.7.1950. Fl. Aug.-Oct.

A common species in forest land and little-used lanes throughout the area. It gives a distinctive purple tinge to the bushlands of the Holbrook and Tumbarumba districts during spring. Hardy, thriving even in heavily rabbit-infested country. Occasionally cultivated.

Glycine *L.*

G. clandestina *Wendl.* 161, Little Billabong, pasture, fl. and fr. 12.1946; 2525, Monument Hill, Albury, plentiful, climbing on bushes, fr. 7.11.1948. Recorded, 2070, Fl. irregular, largely dependent on seasonal conditions; mostly spring and summer,

G. tabacina (*Labill.*) *Benth.* 4495, 5 miles E. of Henty, roadsides, fl. and fr. 24.2.1950; 4546, Albury Cemetery, here and there amongst tall herbage, fl. and fr. 25.2.1950. Recorded, 2981, road embankment at Wodonga, fl. and fr. 15.1.1949.

Widespread at least in the Albury district.

Erythrina *L.* "Coral Tree".

† **E. herbacea** *L.* 4377, Albury Botanic Gardens, cultivated, fl. 22.1.1950. Cultivated in gardens and avenues in several towns at lower elevations.

Pisum *L.*

* **P. sativum** *L.* "Pea". Occasionally spontaneous in waste places and on railway embankments. An important economic vegetable in the Tumbarumba-Batlow districts.

* **P. arvense** *L.* "Field Pea". 3926, Table Top, railway line, occasional, fl. and and early fr. 4.11.1949. Cultivated as green manure crop.

GERANIACEAE

Geranium *L.*

G. pilosum *Forst. f.* 2824, Blue Hill, Munderoo State Forest, Tumbarumba, common in grassed glades, about 2,800′, fl. and fr. 26.12.1948; 579, 1045, Lankey's Creek, pastures, fr. 12.1946; fl. and fr. 6.1.1947; 159, Ralvona Railway Station, 21.12.1946; 1141, Table Top, railway line, fl. 9.10.1947; 1938, Western (Monument)

Hill, Albury, fl. 4.9.1948, 9-Mile Hill, Wagga Road, Albury, 23.8.1949. Observed fl. Monument Hill, Albury, on 18.6.1949 and along railway line at Albury on 30.4.1950. Fl. irregular, largely dependent on seasonal conditions; mostly spring and summer, otherwise for most of the year.

Widespread over a range of habitats.

* **G. molle** *L.* 3966, The Glen, Tumbarumba, around stockyard fence, 9.11.1949; 3993, Carboona Gap, Tumbarumba, common on roadsides, 6.11.1949; 3672, 9-Mile Hill, Wagga Road, Albury, patches in gravel beds, 2.10.1949.

Well established over the whole area.

Erodium *L'Hérit.*

E. cygnorum *Nees.* "Blue Crowfoot". 3079, Henty, 15.2.1949; 3876, Walbundrie, common in grassland, 28.10.1949; 3814, 3818, Goombargana, near Walbundrie, on rocky hillsides and roadsides, 18.10.1949; 3542, Culcairn, railway enclosure, plentiful in clumps, 2.9.1949; 127, Holbrook, 18.12.1946; 3307, Gerogery, fl. and fr. but uncommon, 15.5.1949. Flowering observed to be fairly abundant in the Gerogery district on 8.2.1950. Fl. July-Dec., and to a lesser degree again in autumn.

Widespread and particularly abundant along railway lines and also in grasslands at certain seasons of the year. Its palatability appears to vary with seasonal conditions, for it has been seen scarcely touched in heavily grazed rabbit country, yet confined to sheltered places in other pastures.

A variable species as regards field appearance. Dwarfed forms occur in heavily grazed country. Other erect forms up to two feet high occur for miles along railway lines and in waste places.

* **E. botrys** (*Cav.*) *Bertol.* "Long Storksbill". 3558, Bulgandry Reserve, Bulgandry, red sandy loam grassland, fl. and fr. 8.9.1949; 3584, Goombargana, common on roadsides, fr. 19.9.1949; 3467, 3468, Rand-Goombargana Stock Route, plentiful, 22.8.1949; 3538, Comer Reserve, 6 miles S.W. of Henty, common, 5.9.1949; 3421, 3422, Culcairn railway yards, early fl. 8.8.1949; 2461, 80-Acres Reserve, Gerogery, fl. and fr. 1.11.1948; 1994, Monument Hill, Albury, large patch on waste land, rosette forms only, 12.9.1948; 1844, Eastern Hill, Albury, common, early fl. 17.8.1948; 3622, Waterworks Reserve, Albury, plentiful in pasture, 24.9.1949. Fl. Aug.-Nov., to some degree again in the summer and autumn and occasional plants during the winter.

Widespread.

* **E. cicutarium** (*L.*) *L'Hérit. ex Ait.* 3466, Rand-Goombargana Stock Route, abundant, fl. and fr. 22.8.1949; 3451, Wallandool, near Henty, mostly early fl. 15.8.1949; 3532, Comer Reserve, Henty, plentiful, 5.9.1949; 3437, Alma Park, plentiful on edge of cultivation paddock, 15.8.1949; 3313, Culcairn, railway, young growth prolific, little fl. 27.5.1949; 1108, Holbrook, 12.10.1947; 3600, 3603, Burrumbuttock, railway line, 23.9.1949; 3490, 9-Mile Hill, Albury, abundant in shallow soil over granite, fl. and fr. 23.8.1949. Fl. May-Oct., mostly in early spring.

Widespread and abundant, often inconspicuous when dwarfed. As in other members of the Geraniaceae, the immature fruits of this species appear to be especially palatable to rabbits, while the leaves show little attraction. It has been observed, when collecting, that a whole patch may have the fruits removed where rabbits are plentiful.

* **E. moschatum** (*L.*) *L'Hérit.* "Musky Crowfoot". 2132, The Glen, Tumbarumba, common in pastures, fl. and fr. 4.10.1948; 2042, 3461, 3556, Bulgandry Reserve, Bulgandry, in grassland, 20.9.1948, early fl. 22.8.1949, fl. and fr. 8.9.1949; 1104, Holbrook, fl. and fr. 12.10.1947, 3641, Howlong Common, common, 29.9.1949; 3486, 3630,

Albury, garden weed, 28.8.1949, full fr. 25.9.1949; 3434, Nail Can Hill, Albury, on earth embankment, early fl. 14.8.1949. Occasional fl. observed in Albury gardens on 19.2.1950 and 28.5.1950. Fl. Aug.-Nov., rarely again in autumn.

Widespread but not as plentiful as *E. botrys.*

Pelargonium *L'Hérit.*

P. rodneyanum *Lindl.* Recorded, 2969, 2931, Mt. Stanley (N.E. Victoria), ca. 3,300′, plentiful in shallow soil over granite, 3.1.1949. Probably at least present in the comparable tableland section of the area.

OXALIDACEAE

Oxalis *L.*

O. corniculata *L.* "Yellow Wood-sorrel". 135, Holbrook, fr. 18.12.1946; 3708, Culcairn, roadside, fl. and fr. 3.10.1949; 4261, Bake's Reserve, Gerogery, creek banks, fl. and fr. 14.12.1949; 1936, Western Hill, Albury, 4.9.1948; 3165, 3290, Monument Hill, Albury, fl. 20.3.1949, fr. 8.5.1949. Small forms observed flowering in grasslands at Wymah Gap on 28.2.1950; occasional fl., Monument Hill, Albury on 18.4.1950 and in Henty district on 12.5.1950. Fl. mainly spring and summer, but for most of the year in favourable localities.

Widespread; variable in habit, either tufted or erect. Often abundant with *Rumex acetosella* in impoverished cultivation land.

* **O. pes-caprae** *L.* "Soursob". 1835, Albury Municipal Stone Quarry, common but little in fl. 10.7.1948; 3487, Ettamogah, along railway line, full fl. 22.8.1949; 3761, Albury, garden, end of fl. 12.10.1949. Observed fl. along Jindera-Albury Road on 20.6.1950; occasional fl. Albury gardens on 23.6.1950. Fl. June-Oct.

Common weed in gardens, waste places and old cultivation lands in Albury and environs.

* **O. martiana** *Zucc.* 134, Tumbarumba, troublesome in garden, 23.12.1946.

* **O. purpurea** *L.* 1229, Jindera Gap Reserve, Albury, large patch on wet sand of culvert, 30.10.1947; 3379, 3413, Monument Hill, Albury, plentiful on old garden site, fl. 18.6.1949, 7.8.1949. Fl. at least June-Nov.

Occasional in Albury and environs, on old homestead sites and rubbish heaps.

* **O. latifolia** *H.B. et K.* 4282, Albury, garden weed, fl. 17.12.1949.

* **O. flava** *L.* 4660, Jindera, 10 miles N. of Albury, solid turf in cultivation paddock and around homestead, fl. 15.6.1950.

TROPAEOLACEAE

Tropaeolum *L.*

† **T. majus** *L.* or hybrids. "Nasturtium". 497, Tumbarumba, garden, 5.4.1947. Commonly cultivated.

LINACEAE

Linum *L.*

L. marginale *A. Cunn. ex Planch.* "Wild Flax". 4006, Burra Road, Tumbarumba, a single plant on roadside, fl. 9.11.1949; 3857, Brocklesby Road, Burrumbuttock, occasional amongst roadside scrub, mostly fr. 26.10.1949; 1223, Walla Walla, common on roadside, fl. and fr. 30.10.1947; 2661, Lehmann's Reserve, Walla Walla, in drain from stock tank, fr. 23.11.1948; 2104, 4244, Monument Hill, Albury, plentiful in open scrub, full fl. 27.9.1948, mostly fr. 9.12.1949; 4640, Blue Hill, S. of Henty, occasional in grassland, mostly fr. 12.5.1950. Fl. mostly Sept.-Nov., to a small degree in summer and autumn.

Widespread but now not common, tending to diffuse distribution, mainly in uncleared scrublands and little used roads and lanes. Presumably the "flaxplant" mentioned in Hume and Hovell's diary, noticed at Albury, as plentiful on 16.11.1824 (see Andrews, 1912). Hovell, in Journ. and Proc. Roy. Aust. Hist. Soc. VI (1921), 388-389, mentions that Capt. Hovell saw it when travelling between the Mitta Mitta and Ovens Rivers and states "the flaxplant is, in my opinion, superior to any I have seen in the Colony, the length being from 4½ to 5½ feet; I think the natives make use of it for different purposes." Hovell had noted that at the site of Albury on 16.11.1824 "the flaxplant is common here." An editorial in the *Border Post* of 22.11.1856, referring to the possible use of native plants in the district, says that "The luxuriant growth of the native flax favours the notion that the flax of commerce might be advantageously introduced here." Cleland, in S. Austr. Nat. XII (1931), 68, in discussing the flora of the Adelaide plains, considers that the term "flax plant" may have referred to *Linum marginale* but perhaps more likely to the Australian Blue-bell *"Wahlenbergia gracilis"*. Admittedly *Wahlenbergia* spp. are common in the environs of Albury, but in view of the height being given as four to five feet, it seems certain that the reference here is to *Linum marginale.* This evidence would indicate that this plant was very common prior to settlement.

† **L. usitatissimum** *L.* "Linseed". Increasingly cultivated in the wheat belt during recent years; good plantations have been observed at Walla Walla, Gerogery and Walbundrie.

Luke Gulson observed at Brucevale, a few miles from Wagra (Wymah) a rich flat land on which Mr. Palmer had experimented with various kinds of crops, *flax,* sorghum, tobacco, beet wines, etc. (*Border Post,* 22.1.1886).

* *L.* **gallicum** *L.* 4248, Culcairn Road, 3 miles N. of Gerogery, dense clump on gravel dump, 9.12.1949. Not observed elsewhere in the area.

ZYGOPHYLLACEAE

Tribulus *L.*

‖ **T. terrestris** *L.* "Caltrop". 4489, stock route W. of Henty, in patches, early fl. 14.2.1950; 1018, 1022, Holbrook, extensive patch on vacant allotment, fr. 24.4.1947, 1.5.1947; 3026, 3139, half-mile N. of Culcairn township, fl. 25.1.1949, fl. and fr. 8.3.1949. Observed at Henty and Rand Saleyards. Isolated patches are present at Bungowannah, Burrumbuttock Railway Station and at Gerogery. Fl. summer.

Of sporadic distribution in the wheat area, chiefly in railway, stock and woolshed yards.

Zygophyllum *L.*

Z. billardieri *DC.* Recorded for the adjacent town of Wahgunyah, Murray River, Adcock, 11.9.1919 by Ewart and Tovey (1920, pp. 208-209).

RUTACEAE

Choisya *H., B. et K.*

† **C. ternata** *H., B. et K.* 1762, Culcairn, garden shrub, 8.6.1948. Observed in gardens at Jindera and Gerogery.

Calodendrum *Thunb.*

† **C. capense** (*L. f.*) *Thunb.* "Cape Chestnut". 5821, Albury churchyard, cultivated, fl. 23.12.1951. Occasionally cultivated.

Boronia *Sm.*

B. oppositifolia (*Pers.*) *Cheel.* 4336, Mason's Hill, Tumbarumba, inconspicuous but not uncommon amongst fallen leaves and debris in forest, 28.12.1949; 1345, Mannus Gap, Tumbarumba, uncommon on rocky bank, 2.1.1948. Fl. at least Jan.-Feb.

Observed only in the Tumbarumba district.

§ **B. megastigma** *Nees ex Bartl.* 4813, Henry Showground, retailed by itinerant florist, 5.9.1950. Freely sold by Albury florists, from plants reputed to be grown in Melbourne. I have seen flowering specimens from Albury gardens (September 1950).

Asterolasia *F. Muell.*

A. asteriscophora (*F. Muell.*) *Druce.* Recorded, as *A. correifolia* Benth. var. *muelleri* by Maiden and Betche (1901, p. 80) for Lobb's Hole, (east of the area), W. Forsyth, 11.1900.

Eriostemon *Sm.*

§ **E. myoporoides** *DC.* 2951, Monument Hill, Albury, cultivated in arboretum, 18.9.1948.

Crowea *Sm.*

C. saligna *Andr.* Recorded for the adjacent Pine Mount, Upper Murray (Vic.), C. Walker, 10.1891, by Ewart (1920, p. 193).

Correa *Andr.*

C. reflexa (*Labill.*) *Labill.* 1826, Table Top, uncommon, in clefts of granite outcrops, ca. 1,000′, fl. 18.6.1948.

SIMAROUBACEAE

Ailanthus *Desf.*

* **A. altissima** (*Mill.*) *Swingle.* "Tree of Heaven". 1007, Holbrook, street tree, 8.1.1947.

Once commonly cultivated but now declared noxious. Spontaneous at Talmalmo (Dora Dora), Bowna, railway enclosure S. of Gerogery, in the township of Jindera, Hume Highway at Mullengandra and on the Murray River at Howlong.

MELIACEAE

Toona *M. Roem.*

§ **T. australis** (*F. Muell.*) *Harms.* "Red Cedar". Excellent cultivated specimen present in the Albury Botanic Gardens. Listed by local nurserymen as *Cedrela.*

Melia *L.*

§ **M. azedarach** *L.* var. **australasica** (*A. Juss.*) *C.DC.* "White Cedar". Extensively cultivated as an ornamental tree in many towns of the slopes and wheat areas. Typical *M. azedarach* L. var. *azedarach* may also be cultivated.

TREMANDRACEAE

Tetratheca *Sm.*

T. thymifolia *Sm.* 3984, Tumbarumba-Laurel Hill Road, fairly common, full fl. 8.11.1949; 1210, Carboona Gap, Tumbarumba, uncommon, fl. 18.10.1947. Quite a common species in the tableland region of the Tumbarumba, Laurel Hill and Batlow districts, mostly in forests.

EUPHORBIACEAE

Ricinus *L.*

***R. communis** *L.* "Castor Oil Plant". 3294, Culcairn, several plants in old homestead garden site, 6.5.1949. Fr. material observed in garden at Table Top, 17.7.1950; fr. in Albury garden on 1.8.1950. Uncommon.

Euphorbia *L.*

E. drummondii *Boiss.* "Caustic Weed". 594, Holbrook, 21.2.1947; 4710, Bulgandry Reserve, Bulgandry, in swamp, 14.7.1950; 2959, Table Top, garden weed, 9.1.1949. Numerous records of its occurrence exist in the files of the Albury P.P. Board Office in connection with investigations into poisonous plants. Fl. Oct. to autumn.

Well established throughout the whole area, often a major constituent of summer fallows. Also common along railway lines and yards.

†**E. lathyrus** *L.* "Caper Spurge". 1259A, Holbrook, cultivated in garden, 5.12.1947. Uncommon.

***E. peplus** *L.* "Petty Spurge". 1390, Albury, abundant in garden, 1.2.1948. Fl. and fr. at Talmalmo, on 4.9.1950. Fl. spring to autumn, but variable.

Common in Albury gardens and waste lands. Probably sporadic in the area.

†**E. piscatoria** *Ait.* 3913, Gerogery, garden plant, 31.10.1949; 3563, Albury garden, adventive in damp spot, fl. 5.9.1949.

†**E. pulcherrima** *Willd.* "Poinsettia". Cultivated in Albury gardens. Suffers severely from frosts and scarcely suited to the area.

Poranthera *Rudge*

P. microphylla *Brongn.* 4334, Mason's Hill, Tumbarumba, fairly common in open forest land, 28.12.1949; 151, 5006, Tunnel Road, Woomargama, sub-dominant herb in forest land, 18.12.1946, 2.10.1950. Recorded, 2082, for Indigo Falls, Leneva (N.E. Vict.) ca. 1,000′, common on rocky hillsides, 26.9.1948. Fl. spring and early summer.

Quite a common species in the tableland portion of the area, but present mainly in scrub-lands at lower elevations.

CALLITRICHACEAE

Callitriche *L.*

C. palustris *L.*, sens. lat. 1337, Murray's Crossing, Tumbarumba, semi-floating in running water, 2.1.1948; 4705, Bulgandry Reserve, Bulgandry, in swamp, mostly fr. 14.7.1950; 4838, Lehmann's Reserve, Walla Walla, in swamp, fl. and fr. 23.9.1950; 3629, Burrumbuttock, P.W.P. Tank, fl. 23.9.1949; 3621, Waterworks Reserve, Albury, matted patches on mud, fl. 24.9.1949; 3670, 4722, Mungabarina Reserve, Albury, common on moist clay margins of lagoons, fr. 1.10.1949, mostly fl. 30.7.1950; 4020, The Glen, Tumbarumba, on mud, fr. 10.11.1949. Fl. irregular, mainly Sept.-Oct. otherwise at various times throughout the year.

Widespread in brooks, running streams and ponds. A characteristic of this species is the sweet odour of the drying material observed when preparing herbarium specimens.

ANACARDIACEAE

Pistacia *L.*

†**P. vera** *L.* "Pistachio". Cultivated at Upper Wantagong (Miss Jocelyn Henderson, p.c.).

Schinus *L.*

† **S. molle** *L.* "Peppertree". Extensively cultivated, throughout the area. As well as being the commonest, it is also one of the hardiest ornamental trees. Fl. irregular throughout the year.

Cotinus *Scop.*

† **C. coggygria** *Scop.* "Smoke Tree". 1400, 2631, Albury, garden, end of fl. 1.2.1948, early fl. 21.11.1948. Cultivated in Albury Botanic Gardens. Uncommon.

AQUIFOLIACEAE

Ilex *L.*

† **I. aquifolium** *L.* "English Holly". 1690, Table Top, cultivated, 21.4.1948; 3904, Albury, garden, fl. 31.10.1949.

CELASTRACEAE

Euonymus *L.*

† **E. japonicus** *L.f.* 306, Woomargama, 16.1.1947. Commonly cultivated in gardens and parks throughout the area.

† **E. europaeus** *L.* "Spindle Tree". 1662, Albury, garden shrub, 3.1948; 5730, Bungowannah, cultivated, early fr. 28.11.1951.

STACKHOUSIACEAE

Stackhousia *Sm.*

S. monogyna *Labill.* 3994, Carboona Gap, Tumbarumba, fairly common along rocky banks, fl. 6.11.1949; 5335, Railway Reserve, Tumbarumba, common in scrub land, fl. 11.11.1950; 5187, Munderoo West, common in forest lands, 24.10.1950; 5138, Wallandool near Urangeline, common on rocky hillside, fl. and fr. 18.10.1950; 4939, 6 miles N. of Balldale, clumps on roadside, full fl. 25.9.1950; 3606, Burrumbuttock, common in clumps along railway line, full fl. 23.9.1949; 1134, Table Top, fairly plentiful along railway line, fl. 9.10.1947. Fl. Sept.-Dec.

At present common along most railway lines in the slopes division and in forest lands in the tablelands portion. Undoubtedly a very common species prior to settlement and now restricted to the protected areas.

ACERACEAE

Acer *L.* "Maples"

† **A. negundo** *L.* "Box Elder". 1050, Welaregang, cultivated 27.12.1946; 1048, Holbrook, ornamental tree, fr. 8.1.1947. Commonly cultivated.

† **A. pseudoplatanus** *L.* 1049, Welaregang, cultivated 27.12.1946; 3983, Tumbarumba, street tree, 8.11.1949.

† **A. campestre** *L.* 399, Welaregang, 27.12.1946; 3848, Albury Botanic Gardens, cultivated 24.10.1949, fr. 22.1.1950. Commonly cultivated.

† **A. palmatum** *Thunb.* 3632, Albury, cultivated variety in garden, fl. 23.9.1949.

HIPPOCASTANACEAE

Aesculus *L.*

† **A. hippocastanum** *L.* "Horse-chestnut". 397, Holbrook, street tree, fr. 6.1.1947, fl. at same site on 6.11.1949. Cultivated in Albury Botanic Gardens and an excellent specimen in Olive Street, Albury, in early fr. 8.2.1950. Fl. Nov.-Jan.

Occasionally cultivated.

† **A. parviflora** *Walt.* 4387, Albury Botanic Gardens, cultivated, 22.1.1950.

SAPINDACEAE

Dodonaea *L.* "Hopbushes"

D. viscosa (*L.*) *Jacq.* var. **spathulata** *Benth.* 1308, Carboona Gap, Tumbarumba, not common, fr. 26.12.1947.

D. cuneata *Sm.* 4448, Lockhart Road, 5 miles N.W. of Rand, along roadsides, fl. 9.2.1950; 3449, Pleasant Hills, occasional, 15.8.1949; 2092, Cookardinia Road, Henty, fairly common on roadsides, early fr. 23.9.1948; 3087, Cemetery Reserve, Henty, sparingly distributed, fl. and fr. 18.2.1949. Fl. irregular.

Widespread over the slopes and wheat areas, and still fairly common along little used roads and lanes or on non-cultivated ridges. Probably abundant prior to settlement in these areas.

D. attenuata *A. Cunn.* 1967, 4716, Nail Can Hill, W. Albury, shrubby species to 10′ high, not common, fl. 5.9.1948, 23.7.1950.

Alectryon *Gaertn.*

§ **A. subcinereus** (*A. Gray*) *Radlk.* 3940, 4391, Albury Botanic Gardens, cultivated fr. 2.11.1949, 22.1.1950.

MELIANTHACEAE

Melianthus *L.*

† **M. comosus** *Vahl.* 1275, Woomargama, garden shrub, mainly fr. 20.12.1947. Observed in garden at Gerogery, end of fl. 1.1950. Occasionally cultivated in gardens.

RHAMNACEAE

Paliurus *Mill.*

† **P. spina-christi** (*L.*) *Mill.* 4376, Albury Botanic Gardens, cultivated, 22.1.1950.

Hovenia *Thunb.*

† **H. dulcis** *Thunb.* "Japanese Raisin-tree". 1274, Woomargama, early fl. 20.12.1947. Cultivated in Albury Botanic Gardens.

Ceanothus *L.*

† **C. pallidus** *Lindl.* 5749, Bungowannah, cultivated, fl. 28.11.1951.

† **C.** sp. 5742, Bungowannah, cultivated, fl. and fr. 28.11.1951.

Pomaderris *Labill.*

P. velutina *J. H. Willis.* Recorded, Biggara, near Murray River (Vic.), by Willis (1942, p. 177).

P. apetala *Labill.* 5222, Adelong Road, Tumbarumba, along banks of creek, in bud 26.10.1950; 5448, Paddy's River, Tooma, forming part of scrub along creek banks, fl. and fr. 26.12.1950.

Cryptandra *Sm.*

C. amara *Sm.* var. **longiflora** *F. Muell ex Maid. et Betche.* 3086, 3406, 3540, 4743, Cemetery Reserve, Henty, low shrubby bushes on slate gravel amongst *Callitris* sp., late fr. 18.2.1949, in bud 28.7.1949, fl. 2.9.1949, early fl. 4.8.1950. Final fl. at same locality on 3.10.1949. Not observed elsewhere.

VITACEAE

Vitis *L.*

† **V. vinifera** *L.* "Wine Grape". Albury and district were formerly important wine-producing areas. Vines were first planted in the Albury district in May, 1851, one acre to the east of Kiewa Street; the cuttings were brought from Kyeamba, (Andrews, 1913, p. 12). By 1861, the average yield of vineyards was 650 gallons per acre. Subsequent to that period *Oidium* and *Phylloxera* were instrumental in causing the decline of the industry, until at the present time the vine is cultivated only on a small scale.

Parthenocissus *Planch.* "Virginia Creepers".

† **P. tricuspidata** (*Siebold et Zucc.*) *Planch.* 1389, Albury, garden wall-climber, fl. 1.2.1948. Commonly cultivated in Albury gardens.

† **P. quinquefolia** (*L.*) *Planch.* 1392, Albury, garden creeper, fr. 1.2.1948. Commonly cultivated in Albury gardens.

TILIACEAE

Tilia *L.*

† **T. americana** *L.* "American Linden". 415, Welaregang, cultivated, 27.12.1946; 5433, Wolseley Park, in homestead garden, 27.12.1950. Occasionally cultivated.

† **T. platyphyllos** *Scop.* 400, Corryong (Vic.), forming an excellent avenue in the main street, 26.12.1946. A specimen from an Albury garden may belong to this species.

Sparrmania *L.f.*

† **S. africana** *L.f.* 5748, Bungowannah, cultivated, end of fl., fr. 28.11.1951.

MALVACEAE

Abutilon *L.*

† **A. megapotamicum** (*Spreng. f.*) *St.-Hil. et Naud.* Cultivated in Albury Botanic Gardens.

Modiola *Moench*

* **M. caroliniana** (*L.*) *G. Don.* "Red-flowered Mallow". 2685, Albury, common garden weed, fl. and fr. 28.11.1948. Fl. Oct., into summer.

Very widespread in sheep yards, gardens and waste lands.

Althaea *L.*

† **A. rosea** (*L.*) *Cav.* "Hollyhock". 330, Woomargama, 15.1.1947. Observed fl. and fr. on rubbish tip at Henty on 14.2.1950. Commonly cultivated.

Malva *L.*

* **M. parviflora** *L.* "Small-flowered Mallow". 3303, Gerogery, fr. 15.5.1949; 2569, 2580, Dight's Hill, Albury, fl. and fr. 17.11.1948; 3200, Albury, rubbish heap, mostly fr. 2.4.1949. Fl. mainly spring and summer.

Very widespread and common weed.

* **M. rotundifolia** *L.* "Dwarf Mallow". 328, Tumbarumba, fl. and fr. 1.1.1947; 454, 3253, The Glen, Tumbarumba, 25.12.1946, 25.4.1949. Recorded for Wodonga, mostly fr. 15.1.1949. Fl. mainly spring and summer.

Very widespread and common.

Plagianthus *Forst. et f.*

P. pulchellus (*Willd.*) *Hook. f.* 1129, Boggy Creek, Tumbarumba, uncommon, 2,000′-2,500′, fl. 3.10.1947; 3973, Paddy's River Falls, Tumbarumba, uncommon in damp gully, fl. 9.11.1949. Recorded, 2080, for Indigo Falls, Leneva (Vic.), about 1,000′, uncommon, 26.9.1948. Recorded by Maiden and Betche (1901, p. 79) for Tumbarumba (W. Forsyth, 11.1900) as var. *tomentosus* Hook. f.

A montane species and not plentiful.

Sida *L.*

S. corrugata *Lindl.* var. **corrugata.** 4458, Rand, common in clay loam grassland, 9.2.1950; 3880, 4569, Walbundrie, common in clay loams, 28.10.1949; 6.3.1950; 4187, Ryan near Henty, common on roadside, 3.12.1949. Fl. irregular, largely dependant on seasonal conditions.

Widespread and common over the western half of the area.

Var. **trichopoda** (*F. Muell.*) *Benth.* 4471, 4473, Lockhart Road, Rand, masses in clay along roadsides, fl. and fr. 9.2.1950.

Malvaviscus *Adans.*

† **M. arboreus** *Cav.* 1674, Albury, garden shrub, 16.4.1948.

Lagunaria *G. Don*

§ **L. patersonia** (*Andr.*) *G. Don.* "Norfolk Island Hibiscus". 331, Woomargama, ornamental tree, fl. and fr. 16.1.1947. Cultivated in Albury Botanic Gardens and an excellent specimen seen at Wallandool near Henty. Uncommon.

Hibiscus *L.*

* **H. trionum** *L.* "Bladder Ketmia". 303, Humula, fr. 1.1940; 329, 496, Holbrook, weed in waste land, not common, fl. and fr. 13.1.1947, 2.4.1947. Not observed elsewhere.

† **H. syriacus** *L.* 743, Holbrook, garden shrub, fl. 15.3.1947. Observed in Albury gardens.

Gossypium *L.*

† **G. barbadense** *L.* and † **G. hirsutum** *L.* "Cotton". The minutes of the Albury Municipal Council Meeting of 13.8.1862 record, "That the Town Clerk be instructed to apply to the proper authorities for a supply of cotton seed for distribution amongst growers in the district" (*Border Post,* 16.8.1862). The same paper of 11.5.1863 notes that, "A splendid sample of cotton grown by Mr. John Hore of Cumberoona is now exhibiting at Mate's Union Stores, Albury. The varieties are the Egyptian, and the New Orleans, the latter being particularly fine." "An experienced gentleman" in a note to the *Border Post* of 1.7.1863, sounded a pessimistic note: "cotton has been tried for two years successively, and I do not think it will succeed here. The cold weather comes on too soon for the pods to ripen and the spring is too dry to forward the plants quickly enough." Despite this, it is stated that cotton was grown on the flat near the end of Townsend Street in 1856 (*Border Post Almanac,* 1866, p. 54).

STERCULIACEAE

Brachychiton *Schott et Endl.*

B. populneum *R. Br.* "Kurrajong". Distributed over the whole area and commonest on rocky outcrops and in forest lands. Rarely used for fodder purposes because of the relatively "safe" nature of the district. No serious attempt has been made to protect this valuable native species and natural regeneration is slight. Undoubtedly very common prior to settlement but now receding into well-protected areas.

† **B. × populneoacerifolium** *F. Muell.* 4385, Albury Botanic Gardens, cultivated, fl. 22.1.1950. A hybrid between the preceding and the following species.

§ **B. acerifolium** *F. Muell.* "Flame Tree", and § **B. rupestre** (*Lindl.*) *K. Schum.*, "Bottle Tree", are listed by local nurserymen, but I have seen no specimens.

DILLENIACEAE

Hibbertia *Andr.*

H. stricta (*DC.*) *F. Muell.* var. **stricta** and forms. 1989, 2702, Monument Hill, Albury, scattered distribution, fl. 12.9.1948, late fl. 28.11.1948.

Var. **hirtiflora** *Benth.* 2996, 2997, Nail Can Hill, Albury, common under-shrub in forest land, 22.1.1949.

H. pedunculata *R. Br. ex DC.* 787, Tumbarumba, on rocky roadside, 5.4.1947; 1063, The Glen, Tumbarumba, early fl. 25.12.1946.

H. obtusifolia *DC.* and forms. 781, Tumbarumba, on hard, sandy soil, 6.4.1947; 1064, The Glen, Tumbarumba, 25.12.1946; 3243, Mullengandra, common on ridges and hillsides, 22.4.1949; 1833, Albury Municipal Stone Quarry, isolated plants, 25.7.1948; 3455, Hamilton Valley, Lavington, plentiful but little fl. 22.8.1949; 3674, Jindera Gap, common, fl. 2.10.1949. Recorded for Laurel Hill as *H. linearis* R. Br. ex DC. var. *obtusifolia* (DC.) Benth. by Cambage (1904); also 4689, Ebden, near Wodonga (N.E. Vic.), on railway embankment, early fl. 9.7.1950. Fl. spring to autumn but inconstant.

A widespread species, often common on the poorer soils of ridges and hillsides as well as forest lands.

HYPERICACEAE

Hypericum *L.*

* **H. perforatum** *L.* "St. John's Wort". 429, Tumbarumba, 19.1.1940; 5413, Mundawadra, near Henty, isolated clumps on roadside, end of fl. and early fr. 11.12.1950; 4263, Walla Walla, isolated clumps, fl. 14.12.1949; 2769, Bowna, on roadsides, 7.12.1948; 4358, Hume Weir Road, Thurgoona, patches on roadside, end of fl. 13.1.1950. Fl. Nov.-Jan. in areas under 1,000′ and Dec.-March in tableland section.

The early history of its incidence in the area is given by Calvert (1932), who estimates that some 3,500 acres in the Mannus district of Tumbarumba are heavily infested, while another 3,000 acres further afield are less heavily affected. From the Mannus area it has been diffused by rivers and travelling stock, resulting in infestations within a hundred miles radius. Although at first the establishment of plantations of *Pinus radiata* on affected areas was suggested as a control measure, it was found that after removal of the forest cover the Wort soon reinstated itself after a period of years. The chief control measures are the use of subterranean clover, the promotion of soil fertility and "salting". Preliminary results of experiments on entomological control are promising.

H. japonicum *Thunb.* sens. lat. (incl. *H. gramineum* Forst. f.). 105, The Glen, Tumbarumba, in open forest, 12.12.1946; 1295, Carboona Gap, Tumbarumba, 26.12.1947; 348, Yarrara Gap, Wantagong, 6.1.1947; 3192, 4276, Walbundrie, in gravel pit and on roadside, 29.3.1949, mainly fr. 20.12.1949; 3186, Gerogery, swamp, little fl. 25.3.1949;

2704, Monument Hill, Albury, common, 28.11.1948; 3209, Mungabarina Reserve, along sheltered creek banks, fl. 3.4.1949. Observed fl. and fr. in swamps at Wymah Gap on 28.2.1950. Fl. Dec.-March.

Very widespread and common over a range of habitats, e.g., forest lands, grasslands and swamps.

ELATINACEAE

Elatine *L.*

E. gratioloides *A. Cunn.* "Waterwort". 5149, The Glen, Tumbarumba, creeping on mud in swamps, fl. and fr. 24.10.1950; 1338, Murray's Crossing, Tumbarumba, fairly common under shallow stagnant water or in mud of ephemeral pools, 2.1.1948; 1369, Culcairn Road, Holbrook, in swamps, 10.1.1948; 4535, 4536, Wymah Gap, common along watercourses, fl. and fr. 28.2.1950; 4704, Bulgandry Reserve, Bulgandry, in swamp, fl. 14.7.1950; 4749, Bake's Reserve, Gerogery, on mud, 13.8.1950; 4271, Gerogery, roadside ditches, 21.12.1949. Fl. irregular, mainly spring and summer.

Widely distributed, mostly in mud, often in company with *Limosella* and *Callitriche.*

TAMARICACEAE

Tamarix *L.*

† **T. pentandra** *Pall.* Occasionally cultivated in Albury gardens.

† **T. aphylla** *Karst.* "Athel Tree". Prominently figured by Albury nurserymen.

CISTACEAE

Cistus *L.* "Rock Rose".

† **C. albidus** *L.* 4390, Albury Botanic Gardens, cultivated, fl. 22.1.1950.

VIOLACEAE

Hymenanthera *R. Br.*

H. dentata *R. Br. ex DC.* 3989, Lankey's Creek, occasional bushes on roadsides, fr. 6.11.1949; 3465, Burrumbuttock Road, Jindera, bush on roadside, fl. 22.8.1949. Very common in parts of the Upper Murray Valley, notably Khancoban, where it covers up to several acres; a similar observation is made by Williamson (1929, p. 262) at Upper Biggara on the Victorian side of the Murray River. Occasional in the Holbrook district and a few bushes have been noted in the wheat (western) section of the area.

Hybanthus *Jacq.*

H. monopetalus (*Roem. et Schult.*) *Domin.* Recorded for Mitta Mitta (Vic.), S. F. Clinton, 10.1919, by Ewart and Tovey (1920, p. 198), as *H. filiformis* (DC) F. Muell.

Viola *L.*

V. betonicifolia *Sm.* 3986, Laurel Hill, in forests, 8.11.1949; 1117, 3497, 5153, The Glen, Tumbarumba, fairly common in moist forest, fl. 5.10.1947, 8.11.1949, fl. 24.10.1950. Recorded as plentiful, with *V. hederacea* Labill., in the Tallangatta Valley (Vic.), by Nicholls (1931, p. 145).

V. hederacea *Labill.* 3975, Paddy's River Falls, Tumbarumba, common in forests but few fl. 9.11.1949; 5183, Munderoo West, Tumbarumba, clumps over several yards diameter in open forest, about 2,500′, full fl. 24.10.1950.

CACTACEAE

Opuntia *Mill.*

* **O. inermis** *DC.* Recorded for Albury and Wodonga by Ewart (1930, p. 782) as *O. stricta* (Haw.) Haw.

THYMELAEACEAE

Pimelea *Soland.*

P. linifolia *Sm.* 1232, Jindera Gap Reserve, Albury, uncommon in open forest, fl. 30.10.1947; 3454, Hamilton Valley, Lavington, abundant in open forest, early fl. 22.8.1949; 4717, Nail Can Hill, Albury, early fl. in open forest, 23.7.1950, fl. 11.9.1950. Observed in scattered clumps along Great Southern Railway Line from Ettamogah to Culcairn, full fl. 11.10.1949; also present along the Walbundrie-Culcairn railway. Fl. July-Nov.

Occasionally seen on the uncultivated margins of wheat fields, and ascends to the tableland portion. Probably a common species prior to settlement.

P. curviflora *R. Br.* and forms. 3974, Paddy's River Falls, Tumbarumba, diffuse in forest lands, fl. 9.11.1949; 1262, 1280, Carboona Gap, Tumbarumba, 12.12.1947; 3858, Brocklesby Road, Burrumbuttock, rare and dwarfed, fl. 26.10.1949; 4498, East Henty, few, isolated shrubby bushes on roadside, 24.2.1950; 4918, Alma Park, in cemetery, early fl. 22.9.1950; 4933, 6 miles N. of Balldale, occasional shrubs on roadsides, 25.9.1950; 2701, 2731, Monument Hill, Albury, 28.11.1948, 5.12.1948. Fl. Aug.-Jan.

A widespread species distributed over the whole area; now uncommon in the wheat areas but fairly plentiful in forest lands in the tableland portion.

P. treyvaudii *F. Muell. ex Ewart et Rees.* Recorded for Tallangatta and Cudgewa by Ewart (1930, p. 786).

P. sp. aff. **P. glauca** *R. Br.* 3605, Burrumbuttock, scattered clumps along railway line, 23.9.1949.

LYTHRACEAE

Lythrum *L.*

L. salicaria *L.* "Purple Loosestrife". 5418, Munderoo West Creek, Wolseley Park, along creek banks, early fl. 27.12.1950; 461, 3273, Lankey's Creek, in creek and on moist sand, 2.1.1947, 25.4.1949; 499, Wantagong, in swamps, 25.1.1943; 345, Woomargama, in garden pond, 8.1.1947; 4595, Mungabarina Reserve, Albury, along river banks, fl. 16.3.1950. Fl. Dec.-April.

Widespread in swamps and along creeks but often localised.

L. hyssopifolia *L.* 4308, The Glen, Tumbarumba, roadside drains, fl. and fr. 27.12.1949; 2690, Henty, weed of cultivation paddock, 26.11.1948; 118, Gap Reserve, Woomargama, in creeks and swamps, 13.12.1946, 4272, Gerogery, roadsides, fl. and fr. 21.12.1949; 2798, 2989, Albury, garden weed, 19.12.1948, 22.1.1949. Fl. Oct.-Jan., later in sheltered localities, e.g., amongst tall herbage in permanent swamps.

Widespread and common species showing a wide variety of habitats, e.g., marshes, swamps, cultivated land and often forming a high proportion of fallow herbage during summer. The dead plants persist during the winter. Its dominance is presumably assisted by its relative unpalatability.

Cuphea *P. Br.*

† **C. ignea** *A.DC.* "Cigar Plant". 1394, Albury, garden, 3.2.1948.

Lagerstroemia *L.*

† **L. indica** *L.* "Crepe Myrtle". 1663, Albury, garden, 3.1948. Fl. Jan.-March. Commonly cultivated.

PUNICACEAE

Punica *L.*

† **P. granatum** *L.* "Common Pomegranate". Often cultivated in the Albury district as are also several horticultural varieties.

MYRTACEAE

Acmena *DC.*

§ **A. smithii** (*Poir.*) *Merr. et Perry.* "Lillipilli". 2990, Albury garden, fl. 22.1.1949; fruit persistent until August. Uncommon.

Feijoa *Berg*

† **F. sellowiana** (*Berg.*) *Berg.* 5753, Bungowannah, cultivated, fl. 28.11.1951.

Myrtus *L.*

† **M. communis** *L.* "Myrtle". 5810, Walla Walla, cultivated, fl. 16.12.1951.

Syncarpia *Ten.*

§ **S. glomulifera** (*Sm.*) *Niedenzu.* "Turpentine". 2694, Monument Hill, Albury, in arboretum, fl. and fr. 28.11.1948. Uncommon.

Tristania *R. Br.*

§ **T. conferta** *R. Br.* "Brush Box". Observed in Albury Botanic Gardens and fl. at Burrumbuttock homestead on 8.2.1950. Listed by local nurserymen but uncommon.

§ **T. laurina** *R. Br.* "Water Gum". 4386, Albury Botanic Gardens, cultivated, fl. 22.1.1950.

Eucalyptus *L'Hérit.*

E. spp. A considerable number of species occur in the area and no treatment is attempted in this paper.

Melaleuca *L.*

§ **M. cuticularis** *Labill.* 3933, Albury Botanic Gardens, fl. 2.11.1949.

Leptospermum *Forst. et f.*

§ **L. coriaceum** *Cheel.* 5067, Thurgoona, cultivated in garden, fl. and fr. 10.10.1950.

§ **L. citratum** (*J. F. Bail. et C. T. White*) *Challinor, Cheel et Penfold.* 4428 Albury Botanic Gardens, cultivated, fl. 22.1.1950.

L. lanigerum *Sm.* 653, Paddy's River, Tumbarumba, abundant along creek banks, fl. 24.2.1947.

L. juniperinum *Sm.* 138, 1039, Munderoo, Tumbarumba, common in swamps, fl. and fr. 16.12.1946, 25.12.1946. Recorded, 2746, for Beechworth Road, Leneva (Vic.), 16 miles S.W. of Albury, fl. 4.12.1948.

L. flavescens *Sm.* Recorded for Upper Biggara (Vic.) by Williamson (1929, p. 262) and may occur on the N.S.W. side of the Murray River.

Kunzea *Reichb.*

K. capitata (*Sm.*) *Reichb.* 1354, Woomargama, shrub, 5.12.1947; 5348, Yarrara Gap, Wantagong, single bush on roadside, fl. 13.11.1950; 1459, Walwa (Vic.), plentiful on either side of the Murray River, fl. 9.11.1947. Noted only at these localities.

§ **K. peduncularis** *F. Muell.* 4201, Jindera, garden shrub, fl. 5.12.1949.

Callistemon *R. Br.*

§ **C. rugulosus** *DC.* 1276, Woomargama, garden shrub, fl. and fr. 20.12.1947. Commonly cultivated.

C. paludosus *F. Muell.* 1011, Murray River, Tintaldra, fl. 27.12.1946; 1261, Coppabella Creek, Jingellic, fl. 5.12.1947; 3438, Billabong Creek, Culcairn, plentiful along creek banks, fr. 15.8.1949; 4409, Mungabarina Reserve, Albury, common along creek banks, fl. and fr. 31.1.1950; 5384, Talmalmo, creek banks, in bud and fr. 26.11.1950.

Common along creeks and watercourses at elevations below 1,500′.

Chamelaucium *Desf.*

§ **C. uncinatum** *Schau.* "Geraldton Wax Flower". 3380, 3914, Gerogery, cultivated, in bud 28.6.1949, full fl. 31.10.1949. Commonly cultivated.

Agonis (*DC.*) *Lindl.*

§ **A. flexuosa** (*Willd.*) *Lindl.* 3398, Monument Hill, Albury, cultivated, fr. 23.7.1949.

Baeckea *L.*

B. gunniana *Schau.* 1066, The Glen, Tumbarumba, fairly common in peaty swamps, 25.12.1946; 4319, Munderoo Creek, Mannus, thickets in marshy areas, fl. 27.12.1949. Observed only in these montane areas.

Calytrix *Labill.*

C. tetragona *Labill.* 5383, Talmalmo, forming acres of dense scrub to 6′ high, end of fl. 26.11.1950; 2549, Budgi Trig. Station Hill, Table Top, uncommon in clefts of granite outcrops, 10.11.1948; 2635, Albury, cultivated, 21.11.1948. Recorded, 1458, Walwa (Vic.), plentiful on rocky banks of Murray River, early fl. 9.11.1947.

Widespread, as indicated by the diverse localities.

MELASTOMATACEAE

Tibouchina *Aubl.*

† **T. semidecandra** (*Schrank et Mart ex DC.*) *Cogn.* Listed by local nurserymen as "*Lasiandra grandiflora*" and commonly cultivated.

ONAGRACEAE

Jussiaea *L.*

J. repens *L.* 600, 2-Mile Reserve, Holbrook, common in dam, mainly fr. 10.2.1947; 1380, Howlong Road, Albury, plentiful in mud at edges of lagoons, 4.2.1948. Abundant fl. material seen in creek and in lagoons at Cumberoona Reserve, Bowna on 28.2.1950. Fl. summer.

Widespread and common in lagoons and creeks at elevations below 1,500′, forming dense masses in water during early summer. It is difficult to collect fl. material since the petals are so easily detached.

Epilobium *L.*

E. glabellum *Forst. f.* 2862, Laurel Hill, common in forest, over 3,000′, 27.12.1948; 839, Ournie, roadside, 7.4.1947; 4021, The Glen, Tumbarumba, swamps, 10.11.1949.

Possibly widespread but collected only from these localities. Baker (1902, p. 540), records that: "Mr. J. A. Daley reports that it is greatly used at Bowna in cases of dysentery, and with marked success in chronic cases". This implies that it was a common species at that time.

E. junceum *Forst. f. ex Spreng.* 3232, Pleasant Hills Road, Henty, plentiful in moist roadside drains, 11.4.1949; 148, Mountain Creek, Holbrook, 18.12.1946; 3951, The Glen, Tumbarumba, on moist roadsides, 7.11.1949; 3166, Monument Hill, Albury, forming dense masses in stone quarry, mostly late fr. 20.3.1949; 4543, Albury Cemetery, fl. 25.2.1950. Fl. spring and summer, but irregular.

A common species, often forming dense stands in moist places. Very variable in habit, sometimes straggling when associated with tall herbage, or erect in grassland.

Clarkia *Pursh*

† **C. elegans** *Dougl. ex Lindl.* 1355, Holbrook garden, 6.12.1947. Often cultivated.

Oenothera *L.*

* **O. longiflora** *L.* "Long-flowered Evening Primrose". 156, 10-Mile Creek, Holbrook, patches on sandy bank, 8.12.1946.

* **O. odorata** *Jacq.* "Sweet-scented Evening Primrose". 453, Holbrook, in waste land, 3.1.1947; 3419, 3907, Culcairn, railway yards, common, fl. and fr. 8.8.1949, 31.10.1949; 3301, Gerogery, railway embankment, fl. and fr. 15.5.1949; 4698, Brocklesby, along railway line, fl. and fr. 14.7.1950. Fl. more or less continuous for most of the year.

Well established along most railway lines within the area, otherwise in waste places.

HALORAGIACEAE

Haloragis *Forst. et f.*

H. elata *A. Cunn.* 5018, Walbundrie, clumps on shallow alluvium over granite on rocky knob, early fl. 4.10.1950; 2698, Monument Hill, Albury, common, 28.11.1948; 2998, Nail Can Hill, West Albury, common herb in open forest, end of fl. 22.1.1949.

H. tetragyna (*Labill.*) *Hook. f.* 2878, The Glen, Tumbarumba, in grasslands, 29.12.1948; 4977, Tunnel Road, Woomargama, roadsides, fl. 2.10.1950; 2788, Bell's Road, Gerogery, plentiful in hard ground of railway enclosure, 16.12.1948; 2735, 3772, Monument Hill, Albury, common, fl. 5.12.1948, 12.10.1949. Fl. July-Dec. Observed early fl. at this site on 16.7.1951.

Widespread and common; of no specific habitat, but rare in grazing or cultivation lands.

H. micrantha (*Thunb.*) *Siebold et Zucc.* 1336, Murray's Crossing, Tumbarumba, swamps, 2.1.1948; 680, 2-Mile Reserve, Holbrook, in swamp, 1.3.1947. Observed in road drains at Beechworth (N.E. Vic.).

Prefers very moist localities of marshes and swamps and, like other *Haloragis* spp., tends to assume a red coloration at certain seasons of the year. Another characteristic of this species is that of vegetative galls. Common at localities cited but not observed in the swamps of the wheat areas.

H. heterophylla *Brongn.* var. **heterophylla.** 141, Holbrook, 16.12.1946.

Var. **ceratophylla** (*Zahlbr. ex Endl.*) *Schindl.* 788, 810, The Glen, Tumbarumba, plentiful in creeks, 5.4.1947; 4356, Grubben Reserve, N. of Henty, here and there on dry creek banks, 6.1.1950; 2588, Walla Walla Road, Gerogery, large patch on swampy roadside, 17.11.1948; 2768, Bungowannah, isolated patches on margin of lagoon, 8.12.1948; 3304, Gerogery, dense patch in swampy depression within railway enclosure, fl. 15.5.1949. Fl. summer, extending into the autumn.

A common and widespread variety, often forming dense clumps in marshy ground. The presence of galls simulates the appearance of flowering on casual observation. Its habitat and early vegetative growth are similar to those of *Calotis anthemoides.*

Myriophyllum *L. "Water Milfoils".*

M. pedunculatum *Hook. f.* 1314, The Glen, Tumbarumba, swamp plant in mud under dense sedge flora, 26.12.1947.

M. propinquum *A. Cunn.* 2783, 5102, Bulgandry Reserve, Bulgandry, mostly submerged, 13.12.1948, 16.10.1950; 150, 1357, Culcairn Road, Holbrook, 21.12.1946, 10.1.1948; 1377, Horse Shoe Lagoon, Albury, in swamp, 7.2.1948; 5037, Jindera Road, Gerogery, in swamp, fl. 6.10.1950. Fl. Oct.-Jan.

Widespread and common in swamps, billabongs and creeks. At first submerged, then persisting as an erect plant into the summer. Forms characteristic fringes to lagoons along the Murray River in late summer and autumn.

M. elatinoides *Gaudich.* Recorded as plentiful at Biggara, 15 miles from Corryong (Vic.) by Williamson (1929, p. 261).

M. verrucosum *Lindl.* 1301, Murray River at Walwa, plentiful in lagoon, 27.12.1947; 468, Murray River at Towong, 26.12.1946; 3504, Balldale Road, Howlong, in roadside pools, fl. 1.9.1949; 3060, Mungabarina Reserve, Albury, common in lagoons, 13.2.1949.

Common at least along the course of the Murray River; partly submerged in ponds and lagoons.

M. integrifolium *Hook. f.* 1261A, Holbrook, in swampy paddock, 6.12.1947; 1370, Culcairn Road, Holbrook, semi-creeping in mud, 10.1.1948; 5686, Cemetery Reserve, Henty, abundant in moist clay margins of swampy site, 9.11.1951; 5388, 5395, Gerogery Road, Jindera, under tall, marsh herbage of roadside swamp, 24.11.1950, 28.11.1950. Fl. at least Nov.-Jan.

Not uncommon at lower elevations in the area.

ARALIACEAE

Hedera *L.*

* **H. helix** *L.* "Ivy". 1836, Culcairn, garden creeper, 15.7.1948. Recorded, 1821, for Indigo Falls, Leneva (Vic.), naturalised at head of falls, 23.5.1948. Observed in gardens at Albury and Howlong.

Tieghemopanax *R. Viguier*

T. sambucifolius (*Sieb. ex DC.*) *R. Viguier* var. Recorded, Laurel Hill by Cambage (1904) as *Panax sambucifolius* Sieb. ex. DC. This is the form with narrow pinnae.

UMBELLIFERAE

Hydrocotyle *L.*

H. penduncularis *R. Br. ex A. Rich.* 2853, Laurel Hill, 3,000′-3,300′, common in marshy depression in forest, 27.12.1948; 1316, 1478, 2889, Munderoo Creek, Mannus, in moist sand of creek bed forming dense swards, 28.12.1947, 28.3.1948, 28.12.1948; 2881, The Glen, Tumbarumba, plentiful in bog, 2,200′-2,500′, 29.12.1948; 3061, 3109, 3112, 3113, Mungabarina Reserve, Albury, common in sand along creek banks, 13.2.1949, 23.2.1949. Fl. summer.

Widespread and plentiful at localities cited.

H. vulgaris *L.* 4317, Munderoo Creek, Mannus, marshy area amongst reeds at edge of pool, fl. and fr. 27.12.1949; 5422, Munderoo West Creek, Wolseley Park, moist sand of creek bed, fl. and fr. 27.12.1950. Not observed elsewhere.

H. laxiflora *DC.* "Stinking Pennywort". 1327, The Glen, Tumbarumba, in pasture, 3.1.1948; 120, Woomargama, in pasture, 13.12.1946; 1222, Walla Walla, in hard clay of roadside, 30.10.1947; 2643, Jindera, common in open forest, 23.11.1948; 2763, Monument Hill, Albury, clumps under shady bushes, 5.12.1948. Recorded for Mt. Stanley (N.E. Vic.), about 3,300′, fairly plentiful, 3.1.1949. Observed fl. at Bulgandry on 14.10.1949. Fl. Oct.-Jan.

Widespread and common species over a range of habitats, but seen to the best advantage in forest lands.

H. callicarpa *Bunge.* 3529, 5628, Comer Reserve, Henty, common in pasture, fl. 5.9.1949, mostly fr. 25.10.1951; 2113, Gerogery Common, plentiful in open grassland favouring hard ground, 29.9.1948; 2565, Budgi Trig. Station Hill, Table Top, plentiful in pasture, fr. 10.11.1948; 1993, 3551, Monument Hill, Albury, plentiful in open heathland, 12.9.1948, 4.9.1949; 4993, Ryan, near Henty, grassland, 2.10.1950; 4993, Talmalmo, common in scrub and forest lands, fl. and fr. 2.10.1950. Fl. Aug.-Oct.

As yet not collected in the tableland section, but elsewhere widespread and common though inconspicuous amongst associated growth of spring herbage.

H. sp. aff. H. tripartita *R. Br.* 2826, Laurel Hill, 3,000′, in marshy depressions of forest, 27.12.1948; 1698, 14-Mile Reserve, Howlong Road, Albury, common in moist sand, 9.4.1948; 3111, Mungabarina Reserve, Albury, in moist sand, 23.2.1949.

Centella *L.*

C. asiatica *(L.) Urb.* 3062, Mungabarina Reserve, Albury, on river flat amongst *Polygonum* spp., fl. and fr. 13.2.1949. Not observed elsewhere.

Eryngium *L.*

E. rostratum *Cav.* "Blue Devil". 451, 1302, The Glen, Tumbarumba, in swamps, 25.12.1946, 26.12.1947; 1364, Welaregang, scattered along roads, 21.1.1948; 1439, Burrumbuttock, isolated plants in margin of swamp, 25.2.1948; 2693, Bell's Road, Gerogery, on railway embankment, 26.11.1948; 4183, Howlong-Brocklesby Road, fairly common on roadsides, early fr. 30.11.1949; 2708, Monument Hill, Albury, not common, 28.11.1948. Distributed along the Great Southern Railway Line from Gerogery to Culcairn and causing a distinct bluish coloration in herbage on 19.12.1949. Fl. Nov.-March.

Widespread and of patchy distribution over the area varying from isolated plants to clumps.

Oreomyrrhis *Endl.*

O. andicola (*H., B. et K.*) *Endl.* sens. lat. 122, 2880, 3948, The Glen, Tumbarumba, 2,200′-2,500′, common in open forest, 12.12.1946, 29.12.1948, early fr. and fl. 10.11.1949. Recorded, 2904, Mt. Stanley (N.E. Vic.), about 3,300′, fairly plentiful, 3.1.1949. Fl. Nov.-Jan.

Montane species, plentiful at least in open forests in the Tumbarumba district.

Conium *L.*

* **C. maculatum** *L.* "Hemlock". 123, Holbrook township, plentiful, 18.12.1946; 3861, Burrumbuttock, clump in backyard, fl. 26.10.1949. Small clump observed fl. in waste land at Tumbarumba township on 28.12.1949; in waste land at Walla Walla on 30.11.1949. Fl. Oct.-Dec.

Reported to be common in parts of the Upper Murray Valley, e.g., Tooma and isolated patches in the Tumbarumba district. Otherwise occasional about towns in the remainder of the area.

Apium *L.*

* **A. tenuifolium** (*Moench*) *Thell.* "Slender Celery". 3102, Noreuil Park, Albury, in cultivated ground, mainly fr. 20.2.1949.

Petroselinum *Hill*

† **P. crispum** (*Mill.*) *Nym. ex auct. kew.* "Parsley". 3317, Albury, spontaneous in garden, 5.6.1949.

Lilaeopsis *Greene*

L. australica (*F. Muell.*) *A. W. Hill.* 4315, Munderoo Creek, Mannus, thick stands on margins of pools, fl. 27.12.1949; 3058, Mungabarina Reserve, Albury, forming extensive masses in mud or semi-submerged in lagoons, fl. material scarce 13.2.1949.

Common at least along the course of the Murray River, either forming tangled masses in lagoons or erect plants on mud or drier land but always associated with a high degree of moisture.

Foeniculum *Mill.*

* **F. vulgare** *Mill.* "Fennel". 3080, Billabong Creek, Culcairn, small patch about half chain square, fl. and fr. 15.2.1949; 3009, Jindera Road, Bungowannah, large clump on roadside, early fl. 18.1.1949. Recorded, 3057, Beechworth Road, Leneva (Vic.), large patch, fr. 20.1.1949. Very mature and dead fr. material seen on rubbish heap at Henty on 14.2.1950.

Present in parts of the Tumbarumba district, otherwise occasional patches in diverse areas, e.g., Noreuil Park, Albury.

Pastinaca *L.*

* **P. sativa** *L.* "Parsnip". 617, Boggy Creek, Tumbarumba, spontaneous near drover's camp, 24.2.1947.

Daucus *L.*

D. glochidiatus (*Labill.*) *Fisch., Mey. et Avé-Lall.* "Australian Carrot". 1309, Tumbarumba, common on roadside, fr. 26.12.1947; 124, Tunnel Road, Woomargama, 20.12.1946; 2055, 2061, Bulgandry Reserve, Bulgandry, plentiful in pasture, fl. 20.9.1948; 3523, Comer Reserve, Henty, abundant in pastures, fl. and fr. 5.9.1949; 1991, Monument Hill, Albury, fl. 12.9.1948. Fl. and fr. spring and summer; largely dependent on seasonal conditions.

Over the whole of the area and seen in most sites in its early vegetative growth in winter to the fruiting in summer.

CORNACEAE

Aucuba *Thunb.*

† **A. japonica** *Thunb.* "Gold-dust Tree". Listed by local nurserymen.

ERICACEAE

Arbutus *L.*

† **A. unedo** *L.* "Strawberry Tree". 1271, Woomargama, fr. 20.12.1947; 1686, Table Top, fl. 21.4.1948. Cultivated in Albury Botanic Gardens. Occasionally cultivated.

EPACRIDACEAE

Melichrus *R. Br.*

M. urceolatus *R. Br.* 3964, The Glen, Tumbarumba, fl. and fr. 9.11.1949; 3889, Burrumbuttock, uncommon in open bushlands, fl. 28.10.1949; 1965, 4719, Nail Can Hill, Albury, fl. 5.9.1948, early fl. 23.7.1950; 3334, Monument Hill, Albury, plentiful in forest scrubland, fl. 18.6.1949. Observed in early fl. at Burrumbuttock site on 28.7.1949 and at Jindera Gap, fl. 5.8.1949-13.10.1949. Fl. irregular, at various times throughout the year.

Undoubtedly a common species prior to settlement but now uncommon except in scrub reserves and forests.

Lissanthe *R. Br.*

L. strigosa (*Sm.*) *R. Br.* 4911, Pleasant Hills, clumps on rocky hilltops, end of fl. 22.9.1950; 4900, 5 miles N. of Henty, open scrub on rocky hillside, end of fl. 22.9.1950. Not observed elsewhere.

Leucopogon *R. Br.*

L. virgatus (*Labill.*) *R. Br.* 4328, 5200, Mason's Hill, Tumbarumba, not common, mostly fr. 28.12.1949, fl. 26.10.1950; 3576, 2 miles W. of Jindera Gap, on scrub lands, fl. 19.9.1949; 4715, 4820, Nail Can Hill, Albury, in scrubland, in bud 23.7.1950, full fl. 11.9.1950.

Widespread as indicated by these diverse sites; incidence unknown.

Acrotriche *R. Br.*

A. serrulata (*Labill.*) *R. Br.* 843, 1081, 3950, The Glen, Tumbarumba, fairly plentiful in forests, 4.4.1947, 13.9.1947, 10.11.1949. Recorded for Albury by Smith-White (1948, p. 39).

Brachyloma *Sond.*

B. daphnoides (*Sm.*) *Benth.* 3995, Carboona Gap, Tumbarumba, occasional clumps on rocky banks, fl. 6.11.1949; 4986, Talmalmo, common in scrub lands, fl. 2.10.1950; 4802, Wymah Gap, abundant on rugged hillsides with *Stypandra glauca* and *Eucalyptus polyanthemos,* fl. 27.8.1950; 1227, Jindera, in open forest, early fl. 30.10.1947; 3549, Monument Hill, Albury, early fl. 4.9.1949. Recorded as abundant in Tallangatta Valley (Vic.) by Nicholls (1931, p. 142). Recorded, Albury, J. Frauenfelder, 9.1917, by Blakely (1941, p. 124), as var. *glabrum* Blakely. Fl. Aug.-Nov.

Widespread and common in scrub and forest land of the area, sometimes forming thickets.

Epacris *Cav.*

E. breviflora *Stapf.* 4004, Adelong Road, 3 miles N.E. of Tumbarumba, uncommon in roadside seepage, 8.11.1949. 5181, 5343, Munderoo West, Tumbarumba, forming dense heath scrubs along watercourses to 5′ high, early fl. 24.10.1950, fl. 13.11.1950; observed at same site, end of fl. 26.12.1950. Fl. late Oct.-Dec. Common in the Tumbarumba district and to be expected in parts of the Upper Murray Valley.

PRIMULACEAE

Primula *L.*

† **P. forbesii** *Franch.* 1282, Tumbarumba, garden, fl. 12.12.1947.

† **P. malacoides** *Franch.* 3430, Albury, cultivated 14.8.1949.

† **P. veris** *L.* "Cowslip". 2667, Albury, garden, 21.11.1948; fl. also 23.9.1948.

Anagallis *L.*

* **A. arvensis** *L.* "Scarlet Pimpernel". 2797, 2992, Albury, garden weed, 19.12.1948, 22.1.1949; 3885, Walbundrie, cultivation paddock, fl. and fr. 28.10.1949. Fl. spring to autumn, but with considerable latitude since careful search under tall herbage will exhibit occasional flowering plants in late autumn.

Almost everywhere in cultivated lands. This species is often incriminated in sheep mortalities after grazing on fallow lands during summer and autumn. The reference in the *Border Post* of 13.3.1891 to an injurious weed causing many horses in the Albury district to develop stringhalt ("a small, pink-flowered weed now growing profusely in the herbage") is probably this species or *Centaurium* sp.

* **A. arvensis** *L.* var. "Blue Pimpernel". 5162, Yarrara Gap, Wantagong, on road embankment, fl. and fr. 23.10.1950; 4497, East Henty, roadsides, fl. and fr. 24.2.1950; 3806, Bulgandry Reserve, Bulgandry, in swamp, 18.10.1949; 3853, Brocklesby Road, Burrumbuttock, roadsides and margins of cultivation paddock, 26.10.1949. Abundant fl. material seen along the Howlong-Brocklesby Road on 1.12.1949. Fl. Oct.-Feb.

Well established in the wheat areas and a common weed of cultivation.

PLUMBAGINACEAE

Plumbago *L.*

† **P. auriculata** *Lam.* 1405, Albury, garden, 1.2.1948.

Ceratostigma *Bunge*

† **C. willmottianum** *Stapf.* 628, Tumbarumba, garden, 12.2.1947.

Limonium *Mill.*

† **L. latifolium** (*Sm*) *Kuntze.* "Statice". 844,Tumbarumba, garden, 6.4.1947. Commonly cultivated.

OLEACEAE

Olea *L.*

† **O. europaea** *L.* "Olive". 4959, Gerogery West, cultivated, fr. 4.10.1950; 2806, Albury, garden, 19.12.1948. Sometimes used as a hedge, e.g., Culcairn Railway Station. Cultivated in Albury Botanic Gardens. Long cultivated as implied by an editorial in the *Border Post* of 1.2.1873 discussing the establishment of the olive oil industry: "The *olive* flourishes in this district as in its native soil".

Ligustrum *L.* "Privet"

† **L. lucidum** *Ait. f.* 744, Holbrook, common hedge plant, fr. 3.3.1947. A favourite hedge plant, tending to spread by seed in some gardens.

† **L. ovalifolium** *Hassk.* var. Listed by local nurserymen who also list another species under the name "*L. pubescens*".

Jasminum *L.*

† **J. mesnyi** *Hance.* 1278, Woomargama, garden, end of fl. 20.12.1947. Early fl. in Albury gardens from 22.8.1949, full fl. 19.9.1949. Commonly cultivated.

† **J. humile** *L.* var. **revolutum** (*Sims*) *Kobuski.* 3841, Albury Botanic Gardens, cultivated, 24.10.1949; 5752, Bungowannah, cultivated, fl. 28.11.1951.

Forsythia *Vahl*

† **F. viridissima** *Lindl.* 1122, Tumbarumba, garden shrub, 6.10.1947. Cultivated in Albury gardens, full fl. 9.1949.

† **F.** × **intermedia** *Zabel.* This hybrid is listed by local nurserymen.

Syringa *L.*

† **S. vulgaris** *L.* "Lilac". 401, Holbrook, garden, 7.1.1947. Commonly cultivated.

Fraxinus *L.*

† **F. excelsior** *L.* "Ash". 1051, Welaregang, cultivated, fr. 27.12.1946.

LOGANIACEAE

Buddleja *L.*

† **B. davidii** *Franch.* var. **davidii.** 1065, Woomargama, garden, fl. 8.1.1947. Var. **veitchiana** *Rehd.* Listed by local nurserymen.

† **B. madagascariensis** *Lam.* 4833, Lavington, cultivated in homestead garden, fl. 14.9.1950. Observed flowering in gardens at Gerogery 6.10.1950 and Hume Weir 15.9.1950. Occasionally cultivated.

† **B. alternifolia** *Maxim.* 5650, Albury, garden, cultivated 30.10.1951.

GENTIANACEAE

Cicendia *Adans.*

* **C. quadrangularis** (*Lam.*) *Griseb.* 2126, Lankey's Creek, common on grassy slope of hillside, 3.10.1948; 1173, Holbrook, in swampy paddock, 12.10.1947; 2054, Bulgandry Reserve, Bulgandry, in open pasture paddock, 20.9.1948; 2118, Gerogery Common, plentiful in grassland, 29.9.1948; 2020, eastern slope of Monument Hill, Albury, grassland, 19.9.1948. Observed to be plentiful on railway embankment, Table Top, fl. 24.9.1948. Fl. Aug.-Oct.

Well established and abundant over most of the area though not seen in the tableland portion. Noticeable in early spring pastures but soon obscured by the associated growth of taller herbage.

Centaurium *Hill*

* **C. minus** *Weimm.* 3256, 4291, 4307, The Glen, Tumbarumba, roadsides and grasslands, 24.4.1949, 26.12.1949, 27.12.1949; 5446, Paddy's River, Tooma, white-flowered, in grassland, 26.12.1950; 452, Holbrook, 21.12.1946; 4534, 4807, Wymah Gap, Wymah, fl. material scarce 28.2.1950, fl. 27.8.1950; 5414 Mundawadra, 10 miles N.W. of Henty, abundant on roadsides, full fl. 11.12.1950; 4629, Albury, railway line, fl. in sheltered sites, 13.4.1950. Fl. mainly spring and summer otherwise to a small degree throughout the year.

Widespread and common, seen to the best advantage in grasslands and scrublands during early summer but not confined to any specific habitat. This material though referable to the above species shows an apparent approach to the European *C. pulchellum* (Swartz) Druce var. *ramosissimum* (Gaud.) Gilm. The possibility of hybridisation has to be considered.

Sebaea *Soland. ex R. Br.*

S. ovata *R. Br.* 5184, Munderoo West, Tumbarumba, common herb in open forest, about 2,500′, fl. 24.10.1950; 5161, Yarrara Gap, Wantagong, roadsides, 23.10.1950; 5351, Tunnel Road, Woomargama, clumps on drier sites by roadsides, 18.11.1950; 5105, Bulgandry, fairly common in *Callitris-Eucalyptus albens* woodland, early fl. 16.10.1950. Fl. Oct.-Dec.

Widespread in the area, of localised distribution over a variety of habitats rather than consistent and diffuse throughout tracts of country.

MENYANTHACEAE

Nymphoides *Hill*

N. geminatum (*R. Br.*) *Kuntze.* 654, 4316, Mannus Creek, Tumbarumba, fairly common in ponds and still water, fl. 24.2.1947, early fl. 27.12.1949. Observed only at this site.

APOCYNACEAE

Vinca *L.*

* **V. major** *L.* "Blue Periwinkle". 1763, Gerogery, naturalised on railway line, 13.6.1948. Fl. irregular throughout most of the year.

Commonly cultivated and proving troublesome in gardens; naturalised in waste lands at Albury; patches occur along railway lines in the area.

Variegated form ("var. *variegata*") 1078, The Glen, Tumbarumba, free growth in garden, 13.9.1947.

Nerium *L.*

† **N. oleander** *L.* "Oleander". 410, Holbrook, garden, 8.1.1947; 3402, Albury, garden, fr. 18.6.1949.

Commonly cultivated and persisting on old homestead sites. Several cases of stock poisoning have occurred after ingestion of wilted garden cuttings, yet on other occasions stock have grazed the growing plant with impunity.

ASCLEPIADACEAE

Asclepias *L.* sens. lat. (incl. *Gomphocarpus* R. Br.).

* **A. fruticosa** *L.* "Narrow-leaved Cotton Bush". 4623, Henty, garden plant, fr. 28.4.1950. Recorded for Albury district, 3.1945, G. C. Bartlett, p.c. Occasionally cultivated.

Araujia *Brot.*

* **A. hortorum** *Fournier.* "Moth Plant". Observed in garden at Holbrook, of free growth in fowl-yard, 2.1943. Uncommon.

CONVOLVULACEAE

Cuscuta *L.* "Dodder".

C. australis *R. Br.* 1453, Horse Shoe Lagoon, Albury, on *Polygonum, Cynodon* and *Xanthium* spp., 28.2.1948.

* **C. trifolii** *Bab.* "Clover Dodder". The Germantown (Now Holbrook) correspondent to the *Border Post* of 23.1.1891 refers to a sample of lucerne on the Annandale Estate "attacked by ringworm". The crop was completely destroyed; neither sheep, cattle nor horses would eat it. In appearance it "looks like a cluster of fibrous threads twisted round the stem of the plant". A sample was sent to the Director of Agriculture, Sydney, who reported (30.1.1891), that the botanist had identified the "ringworm" as "*Cuscuta trifolii;* a parasitic plant which had spread over large areas in late years".

Dichondra *Forst. et f.*

D. repens *Forst. et f.* "Kidney-weed". 2833, The Glen, Tumbarumba, common in open forest lands and pastures, 25.12.1948; 3792, Fagan's Reserve, Walbundrie, matted clumps in moist spots, fl. 14.10.1949; 3501, Oil Tree Lagoon, Balldale, matted in depressions of clay pans, non-fl. 1.9.1949. Observed to be common in open, bare ground, Grubben Reserve, N. of Henty, fr. 5.1.1950. Fl. Sept.-Dec., but inconstant during that period, often requiring considerable search to find fl. material.

A widespread species of variable habit, forming dense prostrate clumps on the loam soils of the western section of the region, but more erect in the higher rainfall areas to the east and at higher elevations, especially in loose soil under trees.

Convolvulus *L.*

C. erubescens *Sims.* "Australian Bindweed". 2877, The Glen, Tumbarumba, plentiful, 29.12.1948; 4449, Lockhart Road, 3 miles N.W. of Rand, mostly fr. 9.2.1950; 3074, 3311, railway embankment, Culcairn, 15.2.1949, 27.5.1949; 102, Woomargama, 13.12.1946; 3157, Table Top, railway enclosure, 19.3.1949; 1985, 2732, Monument Hill, Albury, fairly common, 12.9.1948, 5.12.1948; 469, Murray River, Tintaldra, 26.12.1946. Fl. Sept.-March; to May in favourable localities.

Widespread. Of no specific habitat but rarer in grazing lands, often luxuriant in protected scrub or headlands of cropping paddocks.

* **C. arvensis** *L.* "Field Bindweed". 3078, Henty, large patch in railway enclosure, 15.2.1949; 1352, Humula, in garden, 5.1.1948; 101, Ralvona Railway Siding, 21.12.1946; 4542, Albury Cemetery, large patch, fl. 25.2.1950. Fl. Nov.-late summer.

Widespread, as indicated by the diverse localities, and noted mostly in waste lands and along railway lines. Otherwise of diffuse occurrence and not considered a serious pest. Its similarity in some forms to *C. erubescens* makes it difficult to assess its incidence.

POLEMONIACEAE

Phlox *L.*

† **P. paniculata** *L.* "Perennial Phlox". 403, Tumbarumba, garden, 8.1.1947. Commonly cultivated.

Gilia *Ruiz et Pav.*

* **G. squarrosa** *Hook. et Arn.* 450, 3254, The Glen, Tumbarumba, ruderal and cultivated land, 27.12.1946, 24.4.1949. Recorded for Tumut and Tooma by Blakely (1924a).

Well established in the Tumbarumba and Upper Murray districts, uncommon in the slopes and wheat areas.

Collomia *Nutt.*

* **C. grandiflora** *Dougl.* Recorded by Cheel (1924) for Wolseley Park, by P. G. Ricel.

BORAGINACEAE

Heliotropium *L.*

‡ **H. europaeum** *L.* "Common Heliotrope", "Caterpillar Weed". 2968, Rand, common in environs, 10.1.1949; 1449, Henty-Culcairn Road, plentiful in patches, 2.3.1948; 3240, 2 miles west of Brocklesby, plentiful on railway embankment, 14.4.1949; 3248, 6 miles N. of Burrumbuttock, diffuse in haystack enclosure, 22.4.1949; 1413, Howlong-Goombargama Road, isolated patches, 17.2.1948; 1671, 12-Mile Reserve, Howlong Road, Albury, common, 14.4.1948. Early fl. observed at Rand Saleyards on 12.12.1949; fl. and fr. material abundant along Murray Valley Highway from Wodonga to Yarrawonga on 26.1.1950; fl. and fr. Howlong township on 21.2.1950. Fl. Dec.-April.

Localities cited mark the eastern margin of the occurrence of this species in the area, i.e. a semi-circle extending west of Albury, Burrumbuttock to Henty. West of this line the plant is very common; east of it, e.g. Holbrook and Tumbarumba districts, it is rare or absent.

† **H. arborescens** *L.* "Garden Heliotrope". 1406, Albury, garden plant, 1.2.1948.

Cynoglossum *L.*

C. suaveolens *R. Br.* 197, 4641, Henty, in pasture, 4.1942, 12.5.1950; 2707, Monument Hill, Albury, not common, 28.11.1948; 3968, The Glen, Tumbarumba, occasional plants on roadside, fl. 9.11.1949, fr. at this site on 26.12.1949; 4544, Albury Cemetery, occasional, mostly end of fl. 25.2.1950. Fl. Nov.-May.

Widespread but of diffuse occurrence, often in grasslands.

Plagiobothrys *Fisch. et Mey.*

P. elachanthus (*F. Muell.*) *I. M. Johnston.* 2050, 3480, Bulgandry Reserve, Bulgandry, scattered distribution in pasture, 20.9.1948, abundant in barer spots of red loam grassland, 29.8.1949; 3512, Oil Tree Lagoon, Balldale, depressions in claypans, 1.9.1949; 3679, Jindera Gap, 6 miles N. of Albury, uncommon on gravel and stony ridges, 2.10.1949. Fl. Aug.-Oct.

Widespread over the western section of the area and there quite common, ranging from dry, rocky hilltops to moist grasslands. A noticeable characteristic is the rapid development of a brown-black coloration on drying and pressing.

Amsinckia *Lehm.*

* **A. intermedia** *Fisch. et Mey.* 5529, Bungowannah, weed of cultivation paddock, early fl. 1.9.1951.

Various records exist in Pastures Protection Board files of "*A. intermedia*" and "*A. angustifolia*". It has not been possible to investigate these but the genus is known to be widespread in the area.

Myosotis *L.*

M. australis *R. Br.* 3956, The Glen, Tumbarumba, common in grass and scrub lands, fl. 7.11.1949; 1144, Carboona Gap, Tumbarumba, fairly plentiful on rocky bank, 18.10.1947. Recorded No. 2725, Indigo Falls, Leneva (Vic.), fairly common in peaty soil under bracken fern, fr. 4.12.1948.

Noted only from these localities and probably widespread. Certainly common in the Tumbarumba-Laurel Hill-Batlow districts in forests.

† **M. sylvatica** (*Ehrh.*) *Hoffm.* "Forget-me-not". 1123, Tumbarumba, garden plant, 6.10.1947; 3635, Albury, garden, 23.9.1949. Hardy and commonly cultivated.

Echium *L.*

* **E. plantagineum** *L.* "Paterson's Curse". 2451, 2452, Dight's Hill, Albury, white and blue fl., acres in extent, 27.10.1948.

A common weed throughout the slopes and western portion of the area. Especially common at Wymah, Bowna and Mullengandra and the environs of Albury and Howlong. Flowering material is present in some quantity for most months of the year but the maximum fl. occurs from Sept.-Dec.

Bowna and Albury were original foci of this plant and much of the early history is set out by Maiden (1920). The consensus of opinion gained by the writer from older folk in the district is that the plant was introduced from South Australia to Cumberoona near Bowna in the late 1870's. Neighbours, impressed by its hardiness, planted it in their own gardens from where it escaped into paddocks. Dessemination was also assisted by travelling stock since Cumberoona is situated on the main stock route leading from the Upper Murray Valley to the Albury, Wodonga and North Eastern Victorian markets. The original Paterson farm in the Parish of Cumberoona is now submerged under the waters of the Hume Weir reservoir.

The weed did not excite much attention until the early 1890's. The minutes of the Albury Pastoral and Agricultural Society (*Border Post*, 5.12.1890) record a letter from the Director of Agriculture, Sydney, identifying a blue flowered weed from Cumberoona as "*echium violaceum*". "It is a somewhat difficult plant to eradicate when once it gets into cultivated places for if it is left unmolested it produces a great amount of seed, which germinates readily after showery weather at almost any season of the year."

In the intervening decades it has not lost its vitality and now covers thousands of acres, producing vivid purple patches in spring. Some consider it to be of distinct food value and a soil binder, but a solid body of opinion considers it to be a serious menace owing to its capacity to monopolise hundreds of acres of spring pastures.

* **E. italicum** *L.* 5575, Howlong Road, Corowa, along roadsides, mature, 7.10.1951.

VERBENACEAE

Verbena *L.*

‡ **V. officinalis** *L.* "Common Vervain". 3050, Billabong Creek, Rand, diffuse along banks, 7.2.1949; 408, 10-Mile Reserve, Cookardinia, 7.1.1947; 3098, 3104, Noreuil Park, Albury, 20.2.1949. Fl. spring and summer.

Widespread. Observed in many parts of the Upper Murray Valley, e.g., Tooma, Khancoban and Welaregang but nowhere common. It tends to occur as isolated plants here and there along creek banks rather than in stands.

* **V. bonariensis** *L.* "Purple Top". 423, Coppabella Creek, Jingellic, dense stands along banks, 27.1.1946; 3100, Noreuil Park, Albury, in scattered clumps, 20.2.1949. End of fl. on railway embankment, Albury on 30.4.1950. Fl. Jan.-April.

Sporadic distribution; mainly along watercourses, less often in old cultivation paddocks.

* **V. rigida** *Spreng.* "Veined Vervain". 111, Holbrook Cemetery, 13.12.1946; 5808, Albury, patch on footpath, fl. 22.12.1951. Small clump has been observed at Gerogery West. Uncommon.

Lantana *L.*

† **L. montevidensis** (*Spreng.*) *Briq.* Commonly cultivated in Albury gardens.

Aloysia *Ortega et Palau ex L'Hérit.*

† **A. triphylla** (*L'Hérit.*) *Britton.* "Lemon Verbena". 1009, Holbrook, garden, 7.1.1947; 1272, Woomargama, garden, 20.12.1947. Commonly cultivated.

Phyla *Lour.*

§ **P. nodiflora** (*L.*) *Greene.* "Fog-fruit". 4264, Burrumbuttock, cultivated as a "lawn" in prepared beds, 12.12.1949. Specimens have been seen from Walbundrie gardens (August, 1951). Presumably introduced from South Australia and finding favour in the western (wheat) area as a hardy lawn plant.

Clerodendrum *L.*

† **C. fragrans** *Vent.* 4396, Albury Botanic Gardens, cultivated, fl. 22.1.1950.

Duranta *L.*

† **D. repens** *L.* 1404, Albury, garden, 1.2.1948; 4384, Albury Botanic Gardens, fl. 22.1.1950. Commonly cultivated.

Vitex *L.*

† **V. agnus-castus** *L.* "Chaste Tree". Listed by local nurserymen.

LABIATAE

Ajuga *L.*

A. australis *R. Br.* "Australian Bugle". 5178, Munderoo West, Tumbarumba, in forest land, fl. 24.10.1950; 5008, Tunnel Road, Woomargama, in forest, fl. 2.10.1950; 2112, Gerogery Common, plentiful in grassland, 29.9.1948. Recorded for Walbundrie, 17.10.1934 in Albury Pastures Protection Board Office records. Fl. Sept. to early summer.

Common in open forest lands, occasional in grasslands and frequent in railway enclosures.

Teucrium *L.*

T. racemosum *R. Br.* Recorded No. 5794 for Mahonga, 8 miles N.W. of Rand, on roadsides, fl. 10.12.1951, but not observed within the area.

Rosmarinus *L.*

† **R. officinalis** *L.* 1837, Culcairn, garden, 15.7.1948. Commonly cultivated and vary hardy, often persisting on old homestead sites.

Scutellaria *L.*

S. mollis *R. Br.* 2837, Blue Hill, Munderoo State Forest, Tumbarumba, about 2,800′, in bed of ephemeral watercourse, 26.12.1948.

S. humilis *R. Br.* 145, Lankey's Creek, on grassy slope, 23.12.1946. Recorded, 2712, Indigo Falls, Leneva (Vic.), in peaty soil under bracken, 4.12.1948.

Lavandula *L.*

† **L. officinalis** *Chaix.* "English Lavender". 1061, Holbrook, garden, 7.1.1947. Commonly cultivated.

† **L. staechas** *L.* "French Lavender". 2706, Monument Hill, Albury, spontaneous but scarcely spreading, 28.11.1948. Cultivated in some gardens.

Phlomis *L.*

† **P. fruticosa** *L.* 3821, Jindera, garden, 18.10.1949.

Westringia *Sm.*

§ **W. rosmariniformis** *Sm.* 3774, Albury, garden, fl. 12.10.1949.

Prostanthera *Labill.*

P. sp. aff. **P. howelliae** *Blakely.* 3585, 3676, 2 miles W. of Jindera Gap, clump in forest land, fl. 19.9.1949, mostly end of fl. 2.10.1949; early fl. at this site on 17.8.1950.

Marrubium *L.*

* **M. vulgare** *L.* "Hohehound". 3788, Rand, roadsides, 14.10.1949; 349, Cookardinia, 3.1.1947; 3911, Culcairn, roadside, fl. 31.10.1949. Early fl., Tumbarumba district on 10.11.1949; end of fl. mostly fr. 30.12.1949. Fl. Oct.-Feb.

Widespread but of sporadic distribution in settled areas showing preference for sheep camps and yards and pig pens. Has been declared noxious at various times but is difficult to eradicate owing to its diffuse distribution.

Prunella *L.*

P. vulgaris *L.* " Self-heal ". 1348, Rosewood, in damp pastures, white flowers, 2.1.1948; 460, Tumbarumba, plentiful in creeks, 23.12.1946; occasional flowers observed in same district, 10.11.1949; full fl. along Munderoo West Creek, Wolseley Park, 26.12.1950. Fl. Nov.-Feb.

Common in creeks at higher elevations; but not noted at localities under 1,500′.

Stachys *L.*

* **S. arvensis** *L.* " Stagger Weed ". 3297, Culcairn, garden weed, 9.5.1949; 3319, 3760, Albury, garden weed, 5.6.1949, 12.10.1949. Fl. most of the year, but chiefly in spring and summer.

Very widespread and common in cultivated land.

† **S. lanatus** *Jacq.* 3012, Albury, garden, 22.1.1949. Observed to be making free growth in garden at Howlong. Cultivated.

Salvia *L.*

† **S. azurea** *Lam.* 845, Tumbarumba, garden, 6.4.1947.

† **S. officinalis** *L.* " Sage ". 3833, Albury Botanic Gardens, cultivated, fl. 19.10.1949.

† **S. farinacea** *Benth.* 1414, Albury, garden, 17.2.1948. Commonly cultivated.

† **S. coccinea** *Juss. ex Murr.* 3374, Monument Hill, Albury, persistent on old garden site, fl. 18.6.1949.

* **S. verbenaca** *L.* sens. lat. " Wild Sage ". 3492, Balldale, abundant fl. material along miles of road, 1.9.1949; 126, Holbrook, common weed of cultivation, 12.12.1946; 3300, Gerogery, abundant on railway embankment, little fl. 15.5.1949. Observed fl. Adelong Road, Tumbarumba, 8.11.1949; East Henty, early fl. 24.2.1950; fl. in Brocklesby district on 14.7.1950. Fl. most times of the year.

Very widespread and common in settled areas, along miles of roadsides and railway lines and in cultivation paddocks.

Melissa *L.*

* **M. officinalis** *L.* " Balm ". 632, Boggy Creek, Tumbarumba, fairly common along creek bank, 24.2.1947.

Thymus *L.*

† **T. serpyllum** *L.* " Thyme ". 447, Tumbarumba, 23.12.1946. Cultivated.

Lycopus *L.*

L. australis *R. Br.* " Water Horehound ". 424, The Glen, Tumbarumba, forming dense stands along watercourses, usually with *Carex* spp., 26.1.1947; 439, Murray River, Tintaldra, moist localities, 27.12.1946.

In moist spots or along watercourses in the Upper Murray Valley and Tumbarumba; rare or absent from the wheat areas and western section of the area.

Mentha *L.*

M. satureioides *R. Br.* Has been collected from the Railway Reserve, Tumbarumba. Recorded, 2937, Yackandandah (Vic.) about 1,500′ in shady gully, 3.1.1949.

M. diemenica *Spreng.* (*M. gracilis* R. Br. non Sole). 2885, The Glen, Tumbarumba, in open forest, 2,200′-2,500′, 29.12.1948; 144, Little Billabong, 10.12.1946; 4335, Mason's Hill Tumbarumba, patches in shady spots under trees, 28.12.1949; 1374, Howlong Road, Albury, large clump, 7.2.1948; 3063, Mungabarina Reserve, Albury, diffuse in sandy soil, 13.2.1949. Recorded, 3230, Wodonga (Vic.), on creek bank, end of fr. 9.4.1949. Fl. Dec.-March.

Widespread and a fairly common species. Mention is made of a "peppermint plant, which seemed to surpass both in odour and taste, the species generally produced in our garden" by Hume and Hovell in their diary quoted by Andrews (1912, p. 2). The remark was entered for 16.11.1829 on the present site of Albury. Hovell (1921, p. 333) refers to a "peppermint plant different but superior to the English" in Hovell's diary. The reference may be to either *M. diemenica* or *M. australis,* both of which occur at this site. However, in view of the more aromatic nature of *M. diemenica* it is most probable that the reference is to this species, indicating its abundance at that time.

M. australis *R. Br.* 3278, Billabong Creek, 3 miles W. of Culcairn, scattered clumps along shady creek banks, mainly fr. 6.5.1949; 635, Billabong Creek, Holbrook, on shady creek banks, full fl. 30.1.1947; 1376, 4540, 4-Mile, Howlong Road, Albury, large patch in swampy location, 7.2.1948, 28.2.1950. Recorded, 1767, for Indigo Falls, Leneva (Vic.), mainly fr. 13.6.1948. Fl. summer but extending to the autumn.

Of diffuse distribution, occasional patches occurring along creek banks and moist gullies but nowhere common.

* **M. spicata** *L.* "Spearmint". 614, 1407, Holbrook, garden plants of free growth, 6.1.1947, 6.2.1948; 3039, Albury Botanic Gardens, spontaneous, 26.1.1949. Observed fl. Albury gardens on 10.1.1950; end of fl. and mainly fr. 21.2.1950. Fl. Dec.-March.

Commonly cultivated and often spontaneous in gardens. Extensive patches are present by the roadside at Lankey's Creek.

* **M. pulegium** *L.* "Pennyroyal". 425, 609, 841, The Glen, Tumbarumba and environs, abundant in swamps and marshy ground, 26.1.1947, 24.2.1947, 6.4.1947; 700, Carboona Gap, Tumbarumba, 11.3.1947; 4529, Wymah Gap, roadsides, fl. 28.2.1950; 147, Little Billabong, roadsides, 16.12.1946. Observed in full fl., Howlong Road, Albury on 30.12.1949; Gerogery-Henty Road 6.1.1950; occasional plants in fl. Albury district on 25.4.1950. Fl. Dec.-April.

A widespread and common species often present for miles on roadsides; dominant in many swamps; either purple or white flowered

SOLANACEAE

Lycium *L.*

* **L. chinense** *Mill.* 784, Holbrook, garden shrub but growing freely in vacant allotments, 3.4.1947.

* **L. ferocissimum** *Miers.* "Boxthorn". 3943, Walbundrie, hedge plant, fl. and fr. 28.10.1949; 4548, Howlong, hedge plant along roadsides, fl. 21.2.1950. Fl. Sept. to late summer.

Commonly cultivated as a hedge plant, especially at Lavington and Howlong. Isolated bushes occur at Munyabla, Walbundrie and Burrumbuttock.

Physalis *L.*

***P. peruviana** *L.* "Cape Gooseberry". 3267, Table Top, railway line, fr. 24.4.1949. Transient at Holbrook Railway Station in 1945 after transport of coastal fodder during drought period. Uncommon.

‡**P.** *sp.* Recorded No. 5516, Wodonga (N.E. Vic.), on Murray River flats; occasional plants in dry clay beds of lagoons, 21.3.1951. A record exists in the Albury Pastures Protection Board office records for "*P. indica*" from Burrumbuttock, 1.5.1931.

Solanum *L.*

‡**S. nigrum** *L.* "Common Nightshade". 412, Tumbarumba, garden, 26.1.1947; 642, Holbrook, 14.2.1947; 606, 779, The Glen, Tumbarumba, 25.2.1947, 24.3.1947; 691, Jingellic Road, Holbrook, 3.3.1947; 4725, Table Top, in grassland, fl. and fr. 20.5.1950. Observed in full fl. and fr., Albury and environs on 8.5.1950; abundant fl. and fr., Henty district on 12.5.1950. Fl. spring to May, also to a small degree for most of the year.

Widespread and common over the entire area, especially in cultivated lands and around sheep yards and camps. Locally known as "Deadly Nightshade", it enjoys an unsavoury reputation for producing staggers and blindness in stock, more particularly cattle and horses. The evidence to date has been purely circumstantial though consistent.

In a report on cattle mortalities in the adjacent N.E. Victoria in the *Border Post* of 28.2.1874, it was considered that the cause was "Deadly Nightshade", a plant which is "found in more or less quantities throughout the district . . . the botanical term of this plant is *atropa belladonna*; it abounds near cow-sheds and upon lands richly-manured; it chiefly grows along the ground but sometimes rises two or three feet". (The reference to *Atropa belladonna* was doubtless an error.)

Further comment was advanced in the issue of 7.3.1874. "A specimen of *solanum nigrum* was submitted for our consideration. We took a good sniff from the flowers of the plant and the odour was anything but pleasant.

The following morning a burning and itching commenced, the face and nose were much swollen and the outward appearance had every indicated that erysipelas had set in".

The flowers are white and the plant is an annual which yields its berries in this hemisphere in the month of March. The berries produce mania, somnambulism and death. It grows chiefly about stockyards and waste places".

S. laciniatum *Ait.* "Kangaroo Apple". Recorded for Goombargana Reserve, 24.10.1932 in Albury P.P. Board Office Records.

†**S. pseudocapsicum** *L.* "Madeira Winter Cherry". 413, Tumbarumba, cultivated in garden, mainly fr. 26.1.1947; 4435, Bungowannah, isolated plants around homestead, fl. 1.2.1950. Observed in Tumbarumba, Culcairn and Albury gardens; not naturalised, at least to any extent.

***S. rostratum** *Dunal.* "Buffalo Burr". Recorded in a paddock on Jindera-Walla Walla Road but eradicated (J. Esler, p.c.).

†**S. capsicastrum** *Link.* 5741, Bungowannah, cultivated, fl. and early fr. 28.11.1951.

S. simile *F. Muell.* 3583, Rand-Balldale Road, 2 miles W. of Goombargana Hill, isolated bushes, fl. 19.9.1949; 1827, Thornhill Park, Walbundrie, shrub on roadside, 22.6.1948; 2953, Walbundrie Road, Henty, small patch, 17.12.1948.

More or less confined to the wheat areas and of diffuse distribution in the Henty, Walbundrie and Balldale districts. Probably common here prior to settlement but now restricted to occasional scattered plants.

S. esuriale *Lindl.* "Quena". 4573, Bulgandry, clumps in pasture, mostly fr. 6.3.1950; 4562, 5 miles N. of Henty, large patches on roadside, fl. and fr. 6.3.1950; 3152, Table Top, extensive patches up to 20 yards square on railway embankment, fl. and early fr. 19.3.1949; early fl. at this site on 24.2.1950. Fl. summer.

Distributed as sporadic patches along the Great Southern Railway Line from Albury to Yerong Creek, otherwise occasional patches occur in grasslands in the wheat belt.

S. cinereum *R. Br.* "Narrawa Burr". 5489, Cumberoona Reserve, Wymah, occasional plants on Murray River flats, fl. and fr. 2.3.1951. Recorded for Albury 2.1931 in Albury Pastures Protection office records. Specimens have been seen from the Pleasant Hills and Henty districts. Distribution unknown.

† **S. jasminoides** *Paxt.* 1247, Woomargama, garden climber, fl. 3.11.1947; 3375, Monument Hill, Albury, persisting on an old garden site, fl. 18.6.1949. Cultivated at Albury Botanic Gardens and in other gardens in the area.

* **S. triflorum** *Nutt.* "Three-flowered Nightshade". 4265, Bulgandry Reserve, Bulgandry, uncommon, fl. and fr. 12.12.1949; 4578, Bulgandry, grassland, fl. and fr. 6.3.1950; 1660, 1 mile S. of Urangeline East Railway Siding, on fallow land, chiefly fr. 29.4.1948; 3118, Walbundrie, plentiful in cultivation paddock, 25.2.1949. Observed fl. and fr. in fowlyard at Walla Walla on 14.3.1950. Fl. spring and summer.

Specimens have been seen from Holbrook and Thurgoona. A weed of cultivation but occasionally seen in grasslands, occurring sporadically over the western half of the area. The ripe fruits have a characteristic, sickly-sweet odour.

S. pungetium *R. Br.* Recorded for Walwa (N.E. Vict.) by Ewart (1930, p. 1006).

† **S. melongena** *L.* var. **esculentum** *Nees.* "Egg Plant". Reference is made in the *Border Post* of 7.2.1857 to the Egg Plant cultivated in an Albury garden. "One of these curious plants, the seeds of which were brought from the Society Islands. . . . The fruit is of black colour and differs from the yellow, violet and white varieties common in English hot-houses. The fruit somewhat resembles the English marrow and is much used in tropical climates. Egg Plants are now extensively cultivated in some parts of the United States".

At the Exhibition staged by the Albury and Murray River Agricultural and Horticultural Society, "a dish of the fruit of the Egg Plant, from the garden of Mr. Carson, was an object of curiosity to many of the visitors, and we have seldom seen fruit so large in this country (*Border Post,* 3.4.1858).

† **S. tuberosum** *L.* "Potato". Cultivated since the early days of settlement. An important economic vegetable in the Tumbarumba district.

Datura *L.* "Thorn Apples"

* **D. meteloides** *DC. ex Dunal.* 792, stock route, Holbrook, isolated plants, fl. and fr. 4.4.1947; 3106, Brocklesby, about 12 plants in garden, fl. and early fr. 21.2.1949. Fl. and fr. material observed on rubbish dump at Henty, 14.2.1950.

Occasional patches over the western half of the area but not common.

* **D. stramonium** *L.* 411, Jingellic, large patch on roadside, fl. and fr. 27.1.1947; 3124, Rand, very common along Billabong Creek, also in other parts of the district, 25.2.1949; 4620, Murray River, Albury, along banks, fl. and fr. 11.4.1950. Fl. spring and summer.

Very widespread and particularly abundant in many localities, especially along creek banks and in waste lands. It is not unusual to see patches of this plant on gravel heaps dumped for road-making purposes if left undisturbed for any length of time.

* **D. ferox** *L.* 3237, Table Top, in grassland, 3.4.1949; 4635, railway line, Albury, patch on embankment, fl. and fr. 30.4.1950. Recorded for Balldale, coll. C. H. Shiphard, by Blakely (1922b). Uncommon.

Cestrum *L.*

† **C. parqui** *L'Hérit.* 1399, 1665, Albury garden, 1.2.1948, 3.1948. Observed to flower at this site from Oct.-March. Commonly cultivated.

† **C. elegans** (*Brongn.*) *Schlechtend.* 5736, Bungowannah, cultivated, fl. 28.11.1951. Listed by local nurserymen as *Habrothamnus elegans* Brongn.

† **C. nocturnum** *L. and* † **C. purpureum** *Standl.* are listed by local nurserymen.

Fabiana *Ruiz et Pav.*

† **F. imbricata** *Ruiz et Pav.* 2563, Thurgoona, Albury, cultivated 9.11.1948.

Nicotiana *L.*

* **N. glauca** *Grah.* "Tree Tobacco". 3071, Stock Route, Henty, small patch in sandy soil, fl. 15.2.1949; 5716, 10-Mile, Howlong Road, Bungowannah, small clump on roadside, fl. and fr. 19.11.1951. Uncommon.

† **N. tabacum** *L.* "Tobacco". Isolated plants observed in flower at Moorefield's Reserve, W. of Howlong in June, 1949. Once extensively cultivated in the Albury district and in parts of the Upper Murray during the period of early settlement. Drying kilns still remain at Talmalmo (Dora Dora). A review of the difficulties facing the industry in the Upper Murray is given by Brown (1925).

SCROPHULARIACEAE

Verbascum *L.* "Mullein".

* **V. virgatum** *L.* 1062, Lankey's Creek, common weed, 6.1.1947. A common weed in cultivation lands and railway enclosures. Locally called "Wild Tobacco".

* **V. blattaria** *L.* 1365, Tooma, roadsides, 21.1.1948. Similar in incidence and distribution to *V. virgatum*. Probably long established in view of the record by Ewart (1930, p. 1010) "common along the Upper Murray, 1912".

Linaria *Mill.* "Toadflax".

* **L. pelisseriana** (*L.*) *Mill.* 3953, The Glen, Tumbarumba, common in grasslands and along roadsides, fl. 7.11.1949; 3727, 3918, Gerogery, fl. 11.10.1949, full fl. 31.10.1949; 3673, Jindera Gap, 6 miles N. of Albury, dwarf forms, diffuse distribution over gravel ridge, mostly fr. 2.10.1949; 2557, Budgi Trig. Station Hill, Table Top, 10.11.1948; 2100, 2516, 3749, Monument Hill, Albury, common in grassland, early fl. 27.9.1948, mostly fr. 7.11.1948, fl. 12.10.1949. Recorded as long established for several localities in adjacent N.E. Vic. by Ewart (1930). Fl. Sept.-Nov.

Well established and abundant throughout the area in pastures, scrub lands, railway enclosures and open forests.

† **L. bipartita** *Willd.* 1258, Holbrook, garden plant, 6.12.1947. Observed in Culcairn, Walla Walla and Albury gardens so presumably often cultivated.

Cymbalaria *Hill*

* **C. muralis** *Baumg.* "Wandering Sailor". 3037, 3835, Albury Botanic Gardens, troublesome creeper in greenhouses, 26.1.1949, 19.10.1949. Observed to be making free growth in fernery at Table Top and fl. in Culcairn garden on 1.2.1950. Commonly cultivated.

Kickxia *Dumort.*

* **K. elatine** (*L.*) *Dumort.* 1415, Howlong, weed of cultivation, mostly fr. 12.2.1948; 3219, Table Top, roadsides, fl. and fr. 8.4.1949. Observed fl. in fowlyard at Walla Walla on 14.3.1950. Recorded for Howlong, 2.5.1940; Brocklesby, 1.1931; Table Top, 8.3.1935 in Albury P.P. Board Office records. Hurst (1942) records a suspected case of cattle poisoning in the Albury district in 1931. Fl. summer and autumn.

Well established in the wheat areas and a common constituent of summer fallow herbage. It is especially favoured by wet summers and rapidly regenerates under the influence of heat and moisture.

Russelia *Jacq.*

† **R. equisetiformis** *Schlechtend. et Cham.* "Coral Plant". 3932, Albury Botanic Gardens, cultivated, fl. 2.11.1949.

Mimulus *L.*

* **M. moschatus** *Dougl. ex Lindl.* "Monkey Musk". 305, 5272, The Glen, Tumbarumba, plentiful in creeks, 5.12.1946, early fl. 9.11.1950; early fl. at this site on 10.11.1949; 5420, Munderoo West Creek, Wolseley Park, along watercourses, fl. and fr. 27.12.1950. Recorded for the Upper Murray, Victoria (A. Quinn), December 1905 by Cheel (1924). Fl. Nov.-Jan.

Well established along watercourses in the Tumbarumba district. A "splendid specimen of the musk plant" was exhibited at the Albury Flower Show, Nov. 1889 (*Border Post,* 12.11.1889).

* **M. guttatus** *DC.* 2900, Murray's Crossing, Tumbarumba, clumps in moist sand along creek bank, about 2,200′, 27.12.1948.

Apparently naturalised at this site.

M. gracilis *R. Br.* 5968, Mahonga, 8 miles N.W. of Rand in swampy roadside claypans, 16.11.1952.

Gratiola *L.*

G. peruviana *L.* 609, Mannus Creek, Tumbarumba, in creek bed, fl. 24.2.1947; 5435, Paddy's River, Tooma, damp depressions in forest, fl. 26.12.1950; 3191, Walbundrie, in moist spots of gravel pit, 29.3.1949; 4266, Bulgandry Reserve, Bulgandry, common in swamp, 12.12.1949; 4267, Bake's Reserve, Gerogery, in swamp, mainly fr. 14.12.1949; 4531, Wymah Gap, occasional clumps here and there along watercourses, 28.2.1950; 4410, Mungabarina Reserve, Albury, along shady creek banks, 31.1.1950. Fl. Nov.-Feb.

Widespread and common, always in moist localities, e.g., swamps and creeks.

G. nana *Benth.* 3620, P.W.P. Tank, Burrumbuttock, plentiful on moist clay margins, mainly fl. 23.9.1949.

Limosella *L.*

L. australis *R. Br.* "Mudwort". 629, 842, The Glen, Tumbarumba, matted growth on mud along creek beds and in swamps, 12.2.1947, 7.4.1947; 1371, Culcairn Road, Holbrook, in mud, 10.1.1948; 1966, Monument Hill, Albury, in swampy depressions, early fl. 5.9.1948. Recorded, 1425, for Wodonga (Vic.), common in swamps, 21.2.1948. Fl. material observed at Bulgandry on 29.8.1949; in irrigation canals at Mulwala, 26.1.1950; Cemetery Reserve, Henty, after recent rains on 24.2.1950. Fl. irregular, at least July-April.

Very widespread in mud along creeks, margins of lagoons and depressions of "gilgais" in wet seasons, often forming dense interleaving mats. Size and flowering are largely governed by seasonal conditions for often dwarfed forms have abundant flowers whilst larger, more luxuriant growth exhibits few flowers.

L. curdieana *F. Muell.* 1203, Holbrook, floating leaves in shallow pond, 2.11.1947; 2063, Rand Road, Bulgandry, in mud of shallow roadside pools, 20.9.1948; 3515, Oil Tree Lagoon, Balldale, fairly common on moist margins of claypans, full fl. 1.9.1949; 2640, Walbundrie Road, Culcairn, in shallow, rapidly drying, roadside claypans, 23.11.1948; 4711, Bulgandry Reserve, Bulgandry, on mud or submerged in shallow water, fl. 14.7.1950; 5021, Walbundrie, in mud of shallow pools, fl. and fr. 4.10.1950. Fl. July-Feb. but irregular being largely dependant on seasonal conditions.

Widespread and frequent over the western half of the area at elevations less than 1,000′. In similar habitats to those of *L. australis* and often growing in company with it. A favourite habitat is in shallow pools scarcely two inches deep. The floating leaves are similar to miniature leaves of *Ottelia ovalifolia.*

Glossostigma *Wight et Arn.*

G. drummondii *Benth.* 4188, Ryan near Henty, matted clumps in mud of claypans, 3.12.1949; 5387, Cemetery Reserve, Henty, tufts on mud of marshy depressions in grassland, mostly fr. 24.11.1950; 4709, 5097, Bulgandry Reserve, Bulgandry, creeping on mud, 14.7.1950, fl. and fr. 16.10.1950; 5125, Jindera, in mud of ephemeral pool, 17.10.1950. Fl. at least July-Dec. but irregular as one might expect from habitats of high fluctuating soil moisture.

Frequent in swampy depressions in grassland during spring and in swamps at elevations below 1,500′.

Veronica *L.*

V. perfoliata *R. Br.* 154, 4341, Mason's Hill, Tumbarumba, in open forest, fairly plentiful, fl. 3.12.1946, fl. and fr. 28.12.1949.

Noted in various parts of the Tumbarumba township and environs but not elsewhere.

V. derwentia *Andr.* 2875, Laurel Hill, about 3.300′, diffuse amongst *Rubus vulgaris,* 27.12.1948. Recorded, 2078, for Indigo Falls, Leneva (Vic.), about 1,000′, on creek banks and cliffs, late fr. 26.9.1948; and 2939, for Mt. Stanley (Vic.), about 3,300′, fl. 3.1.1949.

Noted only between 1,100′ and 3,300′, a montane species.

* **V. arvensis** *L.* 4289, The Glen, Tumbarumba, common garden weed, mostly fr. 26.12.1949; 1212, Lankey's Creek, on sunny grassed bank over rock, 18.10.1947; 3653, 9-Mile Hill, Wagga Wagga Road, Albury, shaded situations, 2.10.1949; 3839, Albury Botanic Gardens, in flower beds, fl. and fr. 24.10.1949; 3626, 3807, Albury, garden weed, 25.9.1949, 17.10.1948; 1982, Jindera, on grassy bank, 9.9.1948. Recorded,

2717, for Indigo Falls, Leneva (Vic.), plentiful in grassy glade, fr. 4.12.1948; and 2927, for Mt. Stanley (Vic.), about 3.300′, end of fl. and fr. 3.1.1949. Abundant fl. and fr. material observed in forest lands at Tumbarumba on 7-8.11.1949. Fl. Sept.-Jan.

Common weed in gardens throughout the area. Widespread and common in grasslands, forests and on dry rocky ridges with no specific habitat.

* **V. persica** *Poir.* 2655, 3038, 3390, 3832, Albury Botanic Gardens, weed in flower beds, 25.11.1948, 26.1.1949, 24.7.1949, 19.10.1949. Fl. irregular; most of the year in favourable localities.

Noted only in the Albury City Area and there very common in cultivated grounds.

V. gracilis *R. Br.* 4321, Munderoo Creek, Mannus, in marshy area underneath *Baeckea* scrub, vegetative growth fairly plentiful but few fl. 27.12.1949; 5325, Tumbarumba, localised patches in grassland within township, fl. 11.11.1950.

‡ **V. peregrina** *L.* 3474, 3779, 5103, Bulgandry Reserve, Bulgandry, moist situations and on edges of swamp, early fl. 29.8.1949 to 8.9.1949, mainly fr. 14.-17.10.1949, fl. and fr. 16.10.1950; 3705, Henty Common, margin of dam, 3.10.1949; 3637, Howlong Common, fairly common on margins of lagoons, mostly fr. 29.9.1949; 3668, Mungabarina Reserve, Albury, in damp spots, mostly fr. 1.10.1949; 5061, Thurgoona, around margins of muddy pools in grassland, fl. and fr. 10.10.1950. Fl. Sept.-Oct.

Widespread, at least in areas under 1,000′, often forming a border on margins of lagoons or on river flats subject to periodical flooding.

‡ **V. anagallis-aquatica** *L.* 4369, 4509, 4511, Cumberoona Reserve, Bowna, abundant along watercourses, rooted in mud or water, fl. 16.1.1950, fl. and fr. 28.2.1950. Noted only in the Wymah-Bowna districts and there well established along watercourses.

Hebe *Comm. ex Juss.*

† **H. speciosa** (*R. Cunn. ex Hook.*) *Cockayne et Allan.* 684, Holbrook, garden shrub, 28.2.1947.

† **H. parviflora** (*Vahl*) *Cockayne et Allan.* 346, 1277, Woomargama, garden shrub, 8.1.1947, early fl. 20.12.1947.

Digitalis *L.*

† **D. purpurea** *L.* "Foxglove". 5652, Burrumbuttock, cultivated in garden, fl. 30.10.1951.

Parentucellia *Viv.*

* **P. latifolia** (*L.*) *Caruel.* 3954, The Glen, Tumbarumba, grassland, 7.11.1949; 3733, Gerogery, abundant along railway line, 11.10.1949; 1096, Holbrook, 28.9.1947; 3662, Mungabarina Reserve, Albury, common in grassland, on roadsides, 1.10.1949. Fl. Sept.-Nov.

Widespread and common, preferring moist localities. A characteristic habitat is along roadsides throughout the area during spring.

Bellardia *All.*

* **B. trixago** (*L.*) *All.* 5665, 5699, Brocklesby, in cultivation paddocks and spreading, fl. 30.10.1951, end of fl. 19.11.1951; 5653, railway enclosure, 3 miles S. of Gerogery, scattered patches in waste land, fl. 31.10.1951. Reported from several localities in the wheat (western) section and presumably increasing.

BIGNONIACEAE

Clytostoma *Miers ex Bureau*

† **C. callistegioides** (*Cham.*) *Bureau*. 2639A, Albury, garden climber, 21.11.1948.

Campsis *Lour.*

† **C. radicans** (*L.*) *Seem*. 409, Woomargama, garden fl. 15.1.1947. This climber is commonly cultivated under the name of *Tecoma radicans* Juss.

Jacaranda *Juss.*

† **J. acutifolia** *H., B. et K.* 2803, Albury, cultivated, fl. 19.12.1948. Fl. Dec.-Jan., at this site.

Observed in garden at Burrumbuttock but uncommon.

Catalpa *Scop.*

† **C. bignonioides** *Walt.* "Bean Tree". 1060, Carabost State Forest, fl. 28.12.1946. Excellent specimens may be seen in Parade Street, Tumbarumba. Uncommon.

Paulownia *Siebold et Zucc.*

† **P. tomentosa** (*Thunb.*) *Steud.* 1258, Woomargama, several excellent specimens in homestead yard, fl. 23.11.1947. Observed at Holbrook, Jindera, occasional in Albury streets and at Upper Wantawong but not common.

MARTYNIACEAE

Ibicella (*Stapf*) *VanEselt.*

* **I. lutea** (*Lindl.*) *VanEselt.* "Yellow-flowered Devil's Claw". 4575, 4576, Bulgandry, occasional plants in grassland, fl. and early fr. 6.3.1950. Recorded for Albury and Jingellic by Blakely (1923, p. 579).

Proboscidea *Keller*

* **P. jussieui** *Keller*. "Devil's Claw". 3134, Rand, small patch in cultivation paddock, early fr. 25.2.1949; 4580, Thurgoona, occasional plants in bed of stream, fl. and fr., 3.3.1950.

Sporadic patches of non-specified "Devil's Claw" occur from time to time at Goombargana, Holbrook, Howlong, Wymah and Splitter's Creek at Lavington. In the early growth it is often confused with the pumpkin and not eradicated on that account. Occasional fruits have been found in the fleeces of sheep in the Rand district during routine examinations. Both species are diffusely distributed and nowhere common.

LENTIBULARIACEAE

Utricularia *L.*

U. dichotoma *Labill.* 4320, Munderoo Creek, Mannus, abundant in semi-dry marshy area, fl. and fr. 27.12.1949; 648, 1112, 2-Mile Reserve, Holbrook, plentiful in swamp, 10.2.1947, 12.10.1947; 2663, Lehmann's Reserve, Walla Walla, sparingly distributed in swamp, 24.11.1948; 3044, Bake's Reserve, Gerogery, plentiful in bog of permanent swamp, 26.1.1949. Fl. Oct.-Feb.

Widespread and common; present in most permanent swamps of the area. Invariably rooted in mud or water. The purple flowers are distinctive.

U. flexuosa *Vahl.* Recorded, 4417, margin of Yarrawonga Weir Reservoir, Mulwala, in spongy bog, 26.1.1950. Most probably present along the Murray River within the area.

ACANTHACEAE

Acanthus *L.*

† **A. mollis** *L.* 1044, Woomargama, cultivated, 16.1.1947.

Goldfussia *Nees*

† **G. isophylla** *Nees.* 5737, Bungowannah, cultivated, fl. 28.11.1951.

Adhatoda *Nees*

† **A. vasica** *Nees.* 4186, Ryan, near Henty, garden shrub, 3.12.1949.

MYOPORACEAE

Myoporum *Soland. ex Forst. f.*

† **M.** sp. "Boobialla". 1353, Tooma, ornamental tree, 12.12.1947. Extensively planted as a hedge in the Rand, Brocklesby, Walbundrie, Holbrook and Albury districts. Relatively unpalatable to stock, even when growing unprotected near yards.

M. montanum *R. Br.* 3389, 1 mile W. of Pleasant Hills, occasional shrubs on roadside, fl. 11.7.1949. Indigenous to the western margin of the area. Listed by local nurserymen.

Eremophila *R. Br.*

E. longifolia *F. Muell.* 4456, Lockhart Road, 3 miles N.W. of Rand, single shrub on roadside, fl. and fr. 9.2.1950.

PLANTAGINACEAE

Plantago *L.*

P. varia *R. Br.* "Variable Plantain". 1124, Tumbarumba, plentiful in moist forest, 5.10.1947; 3452, Wallandool, in grassland, 15.8.1949; 5053, Ryan, near Henty, clay loam grassland, fl. 13.10.1950; 3156, Table Top, railway enclosure, 19.3.1949. Fl. irregular, at least Oct.-March; most of the year in sheltered sites.

Widespread and common, both in cultivated and non-cultivated lands, reaching maximum development along railway lines, less so in protected scrub lands of poorer soils.

* **P. coronopus** *L.* 5116, Wallandool, near Urangeline, swampy roadside drains, 18.10.1950; 5086, 5366, Ryan, near Henty in clay loam grassland and roadside drains, 13.10.1950, fr. 21.11.1950; 5075, 5655, Bell's Road, Gerogery, common in moist spots of roadside, 13.10.1950, 31.10.1951; 5703, 2 miles S.E. of Balldale, roadsides, 19.11.1951. Recorded, 3571, Chiltern (N.E. Vic.) in railway enclosure, early fl. 17.9.1949. Fl. Sept.-Dec.

Well established, at least, in the western half of the area.

* **P. lanceolata** *L.* "Plantain". 419, 4022, Tumbarumba, in pastures, 24.12.1946, 10.11.1949; 2991, Albury, garden weed, 22.1.1949. Fl. mainly spring and summer but with considerable latitude.

Very widespread in settled areas; pastures, cultivation and waste lands.

RUBIACEAE

Opercularia *Gaertn.*

O. aspera *Gaertn.* 152, Woomargama, in forests, fr. 20.12.1946.

O. varia *Hook f.* 4980, Tunnel Road, Woomargama, clumps on harder ground, fl. and early fr. 2.10.1950.

O. hispida *Spreng.* Recorded 6072, 2 miles E. of Chiltern (Vic.), in *Eucalyptus sideroxylon* woodland, 18.1.1953.

Sherardia *L.*

* **S. arvensis** *L.* "Field Madder". 1350, The Glen, Tumbarumba, in damp open forest, 3.1.1948; fl. at same locality, 7.11.1948; 3856, Brocklesby Road, Burrumbuttock, cultivation paddock, fl. 26.10.1949; 3872, Bungowannah, common in grassland, fl. and fr. 26.10.1949; 3935, Comer Reserve, Henty, grassland, fl. 5.9.1949; 3739, 80-Acres Reserve, Gerogery, pasture, 11.10.1949; 3647, 9-Mile Reserve, Wagga Road, Albury, in gravel pit, 2.10.1949; 3750, Monument Hill, Albury, common in scrub land, 12.10.1949. Fl. Sept.-Jan., mostly Sept.-Oct.

Very widespread and common in settled areas; in cultivated and non-cultivated lands.

Asperula *L.*

A. conferta *Hook. f.* 449, 2122, The Glen, Tumbarumba, common in pastures, 25.12.1946, 3.10.1948; 422, Lankey's Creek, 6.1.1947; 3051, Billabong Creek, Rand, common along banks, mainly fr. 7.2.1949; 2117, Gerogery Common, in pasture, 29.9.1948. Observed to be abundant in forest lands in Tumbarumba and Batlow district, in full flower, both pink and white, 7-8.11.1949. Fl. Sept.-Feb.

A widespread and common species and very hardy. Seen to the best advantage in forest lands but often present in abundance in spring pastures.

Galium *L.*

* **G. murale** (*L.*) *All.* 3977, Paddy's River Falls, Tumbarumba, open forest lands, mostly fr. 9.11.1949; 3481, 3800, Bulgandry Reserve, Bulgandry, fl. 29.8.1949, mostly fr. 14.10.1949; 3881, Walbundrie, roadsides, fr. 28.10.1949; 4219, Walla Walla, in stock reserve, sheltered spots under tall dry herbage, fr. 30.11.1949; 1953, 3657, 9-Mile Hill Reserve, Wagga Road, Albury, plentiful in grassland, 3.9.1948, 2.10.1949. Recorded, 2715, for Indigo Falls, Leneva (Vic.), fr. 4.12.1948. Has been observed at Wallandool (near Henty), railway line at Culcairn, Monument Hill, Albury, and is plentiful in pastures in the Tumbarumba district. Fl. Sept.-Nov.

Very widespread, often abundant in grasslands, but not confined to any specific habitat.

G. gaudichaudii *DC.* and forms. 2884, The Glen, Tumbarumba, plentiful in forest lands, fr. 29.12.1948; 130, 1153, Carboona Gap, Tumbarumba, on rocky banks, fr. 3.12.1946, fl. 18.10.1947; 2022, 2733, Monument Hill, Albury, forming masses at bases of trees and shrubs, fl. 18.9.1948, fr. 5.12.1948. Recorded, 2930, for Mt. Stanley (N.E. Vic.), on granite, about 3,300′, mainly fr. 3.1.1949. Fl. Sept.-Dec.

Widespread and common at localities cited. Mostly in scrub and forest lands, sometimes semi-scrambling, often dwarfed and erect. Yellow-flowered forms predominate.

G. parisiense *L. var.* **australe** *Ewart et J. White.* 129, Tumbarumba, on roadsides, 12.1946; 2543, Gerogery Road, Culcairn, roadsides, 11.11.1948; 3724, 3728, Gerogery, railway line, full fl. 11.10.1949; 2587, Table Top, in cultivation paddock, 17.11.1948. Fl. Oct.-Dec.

Widespread with no specific habitat, common in wheat fields, roadsides, forest lands and swampy depressions. Habit varies from a plant a few inches high to a tangled prostrate mass, purple when mature.

* **G. aparine** *L.* "Goose Grass". 3743, Monument Hill, Albury, garden weed, fl. and fr. 12.10.1949; 3625, 3830, 3936, Albury Botanic Gardens, common in flower beds and waste lands, fl. 24.9.1949, 19.10.1949, fr. 2.11.1949. Fl. Sept.-Oct.

Abundant in the Albury City area and there widespread and common, especially in gardens but extending along the Murray River to Howlong. Apparently long established in view of William Howitt's observation in "Land, Labour and Gold", describing horticultural endeavours in Albury to the end of 1862, regarding "goose grass, chenopodium and Bathurst Burr". (See Andrews (1912, pp. 19-20).)

VALERIANACEAE

Kentranthus *Neck.*

† **K. calcitrapa** (*L.*) *Dufr.* 4205, Jindera, garden, 5.12.1949.

† **K. ruber** (*L.*) *DC.* 5651, Burrumbuttock, cultivated in garden, fl. 30.10.1951. Commonly cultivated and very hardy.

Hort. var. *"alba"*. 5743, Bungowannah, cultivated in garden, 28.11.1951.

CAPRIFOLIACEAE

Sambucus *L.*

* **S. nigra** *L.* "Common Elder". 133, Carboona Gap, Tumbarumba, single shrub, 3.12.1946. Isolated shrubs occur in forest lands at Mannus, Wolseley Park, and occasional fl. plants were observed on the Adelong-Batlow Road, 11.11.1949. Cultivated in Albury Botanic Gardens. Not common.

Viburnum *L.*

† **V. tinus** *L.* "Laurestinus". 735, Tumbarumba, garden shrub, fl. 11.3.1947. Commonly cultivated in gardens and parks throughout the area.

† **V. rigidum** *Vent.* 3842, Albury Botanic Gardens, cultivated, fl. 24.10.1949.

† **V. opulus** *L.* 3845, Albury Botanic Gardens, cultivated, fl. 24.10.1949.

Symphoricarpos *Juss.*

† **S. rivularis** *Suksd.* 405, Holbrook, cultivated, full fl. 7.1.1947.

† **S. orbiculatus** *Moench.* 644, Tumbarumba, garden shrub, 12.2.1947.

Abelia *R. Br.*

† **A. grandiflora** *Rehd.* 1386, 3011, Albury, garden, 1.2.1948, 22.1.1949. Occasionally cultivated, hybrid.

A. chinensis *R. Br.* and † **A. floribunda** (*Martens et Gal.*) *Decne.* are listed by local nurserymen.

Weigela *Thunb.*

† **W. japonica** *Thunb.*, horticultural variety. 3808. Albury, cultivated shrub with pink flowers and variegated leaves, 17.10.1949.

Lonicera *L.* "Honeysuckle".

† **L. fragrantissima** *Lindl. et Paxt.* "Woodbine". 1841, Albury, common in gardens, fl. 14.8.1948. Commenced to fl. in Albury gardens at 7.1950.

† **L. japonica** *Thunb.* 440, Tumbarumba, garden, fl. 23.12.1946.

† **L. brownii** (*Reg.*) *Carr.* 2665, Albury, garden, fl. 21.11.1948.

CUCURBITACEAE

Colocynthis *Boehm.*

* **C. citrullus** (*L.*) *Kuntze.* "Wild Watermelon". 4574, Bulgandry Reserve, Bulgandry, common in paddocks, fl. 6.3.1950; 4587, Mullengandra, along creek banks, fl. and early fr. 11.3.1950.

Widespread with distribution similar to that of *Cucumis myriocarpus.* The fruits of both species are particularly noticeable in the winter fallows. Stacking the melons into pits and subjecting them to fermentation will destroy the seeds.

Cucumis *L.*

* **C. myriocarpus** *Naud.* "Paddy Melon". 4553, Henty, grassland, 3.3.1950; 640, Holbrook, around shearing sheds, fl. and early fr. 14.2.1947; 785, Holbrook Pound Yard, fl. and fr. 4.4.1947.

Widespread and common especially near stock yards, shearing sheds, cultivation paddocks and railway embankments. Undoubtedly long established in the area as Ewart (1909, p. 31) remarks: "has spread principally along the Upper Murray".

CAMPANULACEAE

Wahlenbergia *Schrad.*

W. quadrifida (*R. Br.*) *A.DC.* et sp. aff. 3866, Bungowannah, grassland, 26.10.1949; 2621, 3287, Monument Hill, Albury, 21.11.1948, 8.5.1949; 3180, Mungabarina Reserve, Albury, banks of streams, 21.3.1949.

W. gracilenta *Lothian.* 1343, Mannus Gap, Mannus, open forest, 2.1.1948; 2056, 3796, Bulgandry Reserve, in gravel pit and open paddock, 20.9.1948, 14.10.1949; 3645, Jindera Gap, Albury, diffuse over gravelly ridge, 2.10.1949.

Quite a common species in the drier and barer grasslands of the western half of the district during spring and early summer.

W. *sp. aff.* **trichogyna** *W. T. Stearn.* 106, Carboona Gap, Tumbarumba, 3.12.1946.

W. consimilis *Lothian.* 2108, Monument Hill, Albury, 27.9.1948; 1846, Eastern Hill, Albury, in stone quarry, 17.8.1948. Recorded for Albury (N. Lothian, Nov. 1940) by Lothian (1946, p. 223).

W. bicolor *Lothian* et sp. aff. 3052, Billabong Creek, Rand, creek banks, 7.2.1949; 3146, Culcairn, railway embankment, 18.3.1949; 3222, Lehmann's Reserve, Walla Walla, pasture, 8.4.1949; 3216, Howlong, pasture, 1.4.1949.

This genus remains in need of further revision.

LOBELIACEAE

Lobelia *L.* sens. lat. (incl. *Pratia* Gaudich.).

L. gibbosa *Labill.* 471, Woomargama, occasional in forest, fl. 20.12.1946. Uncommon.

L. purpurascens *R. Br.* 599, 2-Mile Reserve, Holbrook, in swamp, fl. 10.2.1947.

L. concolor *R. Br.* 4478, Lockhart Road, Rand, roadside drains, mostly fr. 9.2.1950; 2776, Corowa Road, Rand, in hard, dry roadside clay, fl. 13.12.1948; 3123, Billabong Creek, Rand, dense clumps in sandy soil in shaded situations, 25.2.1949; 2744, Eyre's Canal, Howlong, in hard clay, 1.12.1948; 2603, Howlong, in pasture, 19.11.1948; 3265, Table Top, final fl. and fr. 24.4.1949. Fl. Nov.-March, less often to April.

Widespread; scattered, but not uncommon at elevations below 1,500′. Maximum development occurs in hard clay loams with a high degree of moisture. Very susceptible to galls and distorted forms are not uncommon, side by side with normal healthy plants. An appreciable amount of vegetative growth persists throughout the year.

Isotoma *R. Br.*

I. axillaris *Lindl.* 107, Tunnel Road, Woomargama, plentiful in rugged situations, 18.12.1946; 3815, Goombargana Hill near Walbundrie, clumps amongst granite rocks, fl. 18.10.1949; 4570, 4685, Walbundrie township, amongst granite rocks on rocky knob, fl. and fr. 6.3.1950, occasional fl. 29.6.1950. Fl. Oct.-March, otherwise to a small degree throughout the year.

Widespread and mostly associated with dry rocky ridges; often flourishing in clefts of rocks. Abundant in the Holbrook and Upper Murray districts, associated with *Cheilanthes tenuifolia, Stypandra glauca,* less often with *Stellaria pungens,* and *Xanthorrhoea* sp.

I. fluviatilis (*R. Br.*) *F. Muell.* 2849, Laurel Hill, 3,000′-3,300′, plentiful along water-race, 27.12.1948; 128, The Glen, Tumbarumba, swamp plant, 16.12.1946; 4532, Wymah Gap, common in swamps, fl. 28.2.1950; 4259, Bake's Reserve, Gerogery, abundant in swamp, full fl. 14.12.1949; 1680, Cumberoona Reserve, common swamp plant, 18.4.1948. Fl. Dec.-March.

Widespread and abundant in swamps and marshy areas though often not apparent because of overgrowth of herbage.

GOODENIACEAE

Velleia *Sm.*

V. paradoxa *R. Br.* 113, Holbrook Cemetery, 18.12.1946; 3895, Burrumbuttock, open forest, fl. 28.10.1949. Recorded, 2748, for Beechworth Road, Leneva (Vic.), 4.12.1948. Observed at Table Top, fl. 10.1944. Noted only at these localities.

Goodenia *Sm.*

G. hederacea *Sm.* Recorded 6073, in railway enclosure, Chiltern (Vic.), 18.1.53.

G. heterophylla *Sm.* 115, Little Billabong, in pasture, 16.12.1946.

G. pinnatifida *Schlechtend.* 2053, Bulgandry Reserve, Bulgandry, grassland, 20.9.1948; 4644, Wallandoon, near Henty, single plant in wooded lane, fl. 12.5.1950; 3693, Cemetery Reserve, Henty, occasional patches in sandy loam, 3.10.1949; 3608, Burrumbuttock, abundant in railway enclosure, full fl. 23.9.1949; 3855, Brocklesby Road, Burrumbuttock, along roads, 26.10.1949; 4214, Brocklesby, common in railway land, mostly fr. 1.12.1949; 2116, Gerogery Common, grassland, 29.9.1948; 3736, 80-Acres Reserve, Gerogery, grassland, 11.10.1949; 1135, Table Top, 9.10.1947; 3654, Waterworks Reserve, Albury, pasture, 2.10.1949. Fl. Sept.-Nov., occasionally at other places and times throughout the year.

Widespread and common species at lower elevations in grasslands, but seen to the best advantage in railway and other protected sites.

G. paniculata *Sm.* 647, 2-Mile Reserve, Holbrook, in swamp, 10.2.1947.

G. gracilis *R. Br.* 114, 730, Holbrook around swamps, 18.12.1946, 15.3.1947; 2777, Oil Tree Lagoon, Balldale, plentiful on margin of dried-out swamp, 13.12.1948; 4236, Cemetery Reserve, Henty, dense clumps on margin of swamp, on a clay loam subject to seasonal inundation, fl. 9.12.1949; 3225, 3302, Gerogery, moist clay on railway line, fl. 8.4.1949, mostly fr. 15.5.1949. Fl. Oct.-April, mostly in late spring and summer but irregular.

Widespread and common in the western half of the area. A variable species, often abundant on hard clay margins of swamps or lands subject to seasonal inundation.

G. pusilliflora *F. Muell.* 2053, 3485, Bulgandry Reserve, Bulgandry, grassland, fl. 20.9.1948, 29.8.1949-8.9.1949; 4908, Pleasant Hills, abundant on roadsides, 22.9.1950; 4952, Alma Park, grassland, 26.9.1950; 3513, 3695, Cemetery Reserve, Henty, gravel of dam banks and pastures, fl. 2.9.1949, fr. 3.10.1949. Fl. Aug.-Sept.

A widespread and common species in the western half of the area.

BRUNONIACEAE

Brunonia *Sm.*

B. australis *Sm.* 155, 1310, Tumbarumba, in pasture, more commonly in open forests, 3.12.1946, 26.12.1947, early fl. at this locality on 8.11.1949; 5766, Wymah Gap, occasional plants on road embankment, fl. 29.11.1951; 2526, 4283, Monument Hill, Albury, full fl. 7.11.1948, end of fl. 17.12.1949. Fl. Oct.-Dec. Of sporadic occurrence though widespread; mostly in lighter and drier soils and open forest country.

STYLIDIACEAE

Levenhookia *R. Br.*

L. dubia *Sond.* 1143, Lankey's Creek, pasture, 18.10.1947; 4994, Talmalmo, scrub land, 2.10.1950; 5002, Tunnel Road, Woomargama, forest, 2.10.1950; 2051, Bulgandry, plentiful in open grassland, 20.9.1948; 4904, Henty, abundant in grassland, 22.9.1950; 4925, Triangle Reserve, Brocklesby, in *Callitris* forest, 25.9.1950; 1997, Monument Hill, Albury, on open bare ground of scrub, early fl. 12-18.9.1948. Fl. Sept.-Oct.

Widespread and very common, at least in areas under 1,500′, over a variety of habitats. Examination over a few square yards of scrub lands or drier hillsides will reveal scores of plants. Flowers vary from white to pale pink; the whole plant assumes a reddish colour when mature.

Stylidium *Swartz ex Willd.*

S. graminifolium (*Labill.*) *Rich.* 5212, Railway Reserve, Tumbarumba, fairly common in scrub land, 26.10.1950; 4337, Mason's Hill, Tumbarumba, occasional in open forest land, mostly fr. 28.12.1949. Recorded on Howlong Road, Chiltern (N.E. Vic.), plentiful, as "Grass Trigger Plant" by Williamson (1929, p. 259).

S. despectum *R. Br.* 5386, 5685, Cemetery Reserve, Henty, frequent in rapidly-drying mud of inflow of stock tank under dense growth of *Amphibromus neesii, Eleocharis* spp. and *Goodenia gracilis,* 24.11.1950, 9.11.1951; 5399, Gerogery Road, Jindera, rooted in mud of permanent soakage off roadside, 28.11.1950; 5606, Thurgoona, near Albury, in muddy pool off roadside, early fl. 16.10.1951; 5046, 5096, Monument Hill, Albury, around shallow pools in bed of gravel excavations, early fl. 8.10.1950, 15.10.1950. Fl. Oct.-Nov. Observed only at these sites.

COMPOSITAE

Vittadinia *A. Rich.*

V. triloba (*Gaudich.*) *DC.* var. **triloba.** 444, Holbrook, in pastures, 3.1.1947; 4492, East Henty, abundant on roadsides, 24.2.1950; 4208, 4211, Brocklesby, roadsides, 1.12.1949; 2651, Gerogery, roadsides, 24.11.1948; 2102, 2103, Monument Hill, Albury, 27.9.1948. Fl. irregular, often over extended periods according to seasonal conditions.

Widespread; often sub-dominant in pastures, common along roadsides and forest lands.

Var. **lanuginosa** *J. M. Black.* 4019, The Glen, Tumbarumba, fl. 10.11.1949; 4363, Grubben, N. of Henty, in dry grassland, 6.1.1950; 4494, East Henty, abundant on roadsides, 24.2.1950; 1677, Cumberoona Reserve, Bowna, 18.4.1948. Recorded, 1693, Wodonga (Vic.), on railway embankment, 26.4.1948. Fl. irregular.

Distribution and habitat similar to those of the type variety which is often mixed with it.

Aster *L.*

* **A. subulatus** *Michx.* "Bushy Starwort". 3235, Pleasant Hills Road, Henty, isolated plants on roadside, 11.4.1949; 3275, Lankey's Creek, along creek banks, 25.4.1949; 1451, Horse Shoe Lagoon, Albury, 28.2.1948; 3195, Albury, common ruderal weed, 27.3.1949. Fl. Jan.-May.

Widespread and common.

† **A. novi-belgii** *L.* var. 723, Tumbarumba, garden plant of free growth, 11.3.1947; 1387, Albury, garden, but proving troublesome, 1.2.1948.

Commonly cultivated and very hardy.

Erigeron *L.* sens. lat.

† **E. mucronatus** *DC.* 1410, Albury, garden plant, 14.2.1948. Commonly cultivated in Albury gardens.

* **E. canadensis** *L.* 4547, Albury Cemetery, 25.2.1950. Recorder, 1766, Indigo Falls, Levena (Vic.), fairly plentiful along creek, 13.6.1948.

* **E. floribundus** (*H., B. et K.*) *Schultz-Bip.* and * **E. bonariensis** *L.* are both represented in the New South Wales National Herbarium by specimens from the area.

Calotis *R. Br.*

C. cuneifolia *R. Br.* 3085, 3519, 4648, Cemetery Reserve, Henty, patches in red clay loam grassland, late fr. 18.2.1949, early fl. 2.9.1949, fl. and fr. 9.6.1950; 1107, Holbrook, 12.10.1947; 2019, Walbundrie, common in open forest land, full fl. 17.9.1948; 3894, Burrumbuttock, open forest, fl. and fr. 28.10.1949; 4192, Walla Walla, grassland, mostly fr. 30.11.1949. Fl. mainly Sept.- Nov., otherwise to a small degree throughout the year.

A common species in the western section of the area, i.e., the wheat belt, preferring drier sites in grasslands, and open woodlands. It is still relatively common on heavily-grazed stock routes and reserves.

C. scabiosifolia *Sond. et F. Muell.* 4003, Adelong Road, 3 miles N.E. of Tumbarumba, not common, fl. 8.11.1949; 5967, Mahonga, N.W. of Rand, 16.11.1952.

C. anthemoides *F. Muell.* 3511, Cemetery Reserve, Henty, patches in red loam of grassland, 2.9.1949; 3553, Bulgandry Reserve, Bulgandry, patches in red clay loam, depression in grassland, 8.9.1949; 1171, 2-Mile Reserve, Holbrook, in marshy spots, frequent in clumps, 11.10.1947; 2009, Walbundrie, common on roadsides, 17.9.1948. Occurs in dense patches, up to acres in extent in Rand, Walbundrie and Burrumbuttock districts, and even on a vacant allotment in Henty township, (in full fl. 3.10.1949). Fl. Sept.-Nov.

Prefers moist localities, especially damp depressions in pastures, roadside drains and ditches. Immature rays are purple, turning white at maturity. Seldom touched by grazing stock.

C. lappulacea *Benth.* 3924, Pemberton Street, Albury, single plant on footpath, 3.11.1949; 5064, Thurgoona, near Albury, single plant in grassland, 10.10.1950. Not observed elsewhere.

C. hispidula (*F. Muell.*) *F. Muell.* "Bogan-flea". 2046, 2057, 3475, Bulgandry, plentiful in open grassland, 20.9.1948, 29.8.1949; 3495, Oil Tree Lagoon, Balldale, 1.9.1949; 3514, 3688, Cemetery Reserve, Henty, diffuse but frequent, 2.9.1949, 3.10.1949; 4697, Wallandool Reserve, near Urangeline, mostly fr. 14.7.1950; 4927, Triangle Reserve, Brocklesby, diffuse in ground cover of *Callitris* forest, 25.9.1950. Fl. mainly July-Oct. otherwise inconstant.

Observed only in the loam soils of the western section of the area and there quite common in natural grasslands.

C. scapigera *Hook.* 4438, Community Park, Howlong, on Murray River flats, of diffuse distribution, fl. and fr. 8.2.1950.

Brachycome *Cass.*

B. decipiens *Hook. f.* 5172, Munderoo West, near Tumbarumba, around and under heath scrub swamp, about 2,500′, mostly fr. 24.10.1950.

B. ptychocarpa *F. Muell.* 3971, Paddy's River Falls, Tumbarumba, diffused but not uncommon in forest lands, 9.11.1949.

B. lineariloba (*DC.*) *Druce.* 5549, Wallandool Reserve, near Urangeline, localised patches in drying or dried-out clay pans, fl. and fr. 18.9.1951; 4865, 2 miles S.E. of Balldale, sandy soil of *Callitris* forest reserve, 24.9.1950; 5052, Ryan, near Henty, in clay loam grassland, fr. 13.10.1950. Recorded No. 5532, Oaklands (west of the area), abundant in claypans, mostly fr. 27.9.1951.

Observed only in the western margin of the area.

B. basaltica *F. Muell.* var. **gracilis** *Benth.* 2644, 4965, 5038, Jindera Road, Gerogery, not common in swamp, 23.11.1948, fl. 4-6.10.1950. Recorded for Albury (coll. J. Wilson, 1890), by Davis (1949, p. 150). Recorded No. 5574, 4 miles W. of Rutherglen (N.E. Vic.), small clump rooted in wet clay roadside drain, fl. and fr. 7.10.1951.

B. melanocarpa *Sond. et F. Muell.* Recorded, 2069, Beechworth Road, Leneva (Vic.), on hard slate of roadside bank, 26.9.1948; 2072, 2086, 2088, Indigo Falls, Leneva (Vic.), plentiful in undergrowth of moist forest, 26.9.1948. As all the above are in flower only the determinations are not critical.

B. aculeata (*Labill.*) *Less.* 5452, Paddy's River, Tooma, occasional plants in open forest land, fl. and fr. 26.12.1950.

B. marginata *Benth.* var. **marginata**. 3906, 4541, Culcairn, clump in hard clay loam of open forest land, 31.10.1949, fl. 24.2.1950; 2691, Gerogery, railway embankment, fl. and immature fr. 26.11.1948; 4831, 6 miles W. of Brocklesby, clumps on roadside, fl. 20.9.1950.

B. goniocarpa *Sond. et F. Muell.* 3786, Bulgandry Reserve, Bulgandry, grassland, end of fl. 14.10.1949; 2013, Walbundrie, grassland, fl. 17.9.1948; 3690, Cemetery Reserve, Henty, occasional patches in pasture, 3.10.1949; 5111, Wallandool, near Urangeline, grassland, mostly fr. 18.10.1950; 5081, Ryan, near Henty, abundant in parts of grassland, 13.10.1950; 4928, Triangle Reserve, Brocklesby, common in ground cover of *Callitris* forest, fl. 25.9.1950; 3646, 2 miles W. of Jindera Gap, fairly common on gravelly ridge, 2.10.1949; 1986, 3766, Monument Hill, Albury, scattered distribution in open forest land, 12.9.1948, 12.10.1949; 3813, Nail Can Hill, West Albury, end of fl. 17.10.1949. Recorded by Davis (1948, p. 203) from Murray River, near Albury, collected by J. Wilson, 1890. Fl. Sept.-Oct.

Widespread in drier grasslands, scrub lands and rocky hilltops in the western half of the area.

B. muelleroides *G. L. Davis.* 5543, 5693, Wallandool Reserve, near Urangeline, margins of clay pans or moist depressions in grassland, 18.9.1951, mostly fr. 12.11.1951; 3555, 3799, 5126, 5537, Bulgandry Reserve, Bulgandry, on moist clay, common along margins of lagoons, in mud or water, early fl. 8.9.1949, abundant fl. and fr. 14.10.1949, 16.10.1950, 18.9.1951; 3801, Fagan's Reserve, 3 miles N. of Walbundrie, plentiful on margins of lagoons, in mud or water, mixed with *Calotis anthemoides,* 14.10.1949. Fl. Sept.-Oct.

Plentiful at these localities in the Walbundrie district.

B. diversifolia (*Grah.*) *Fisch. et Mey.* var. **diversifolia.** Recorded for Tumbarumba, 11.1900, W. Forsyth, by Davis (1948, p. 199).

B. ciliaris (*Labill.*) *Less.* var. **subintegrifolia** *G. L. Davis.* 5112, Wallandool Reserve, near Urangeline, common in swampy land off roadside, 18.10.1950; 4237, 4500, 4737, 5391, 5558, Cemetery Reserve, Henty, diffuse in clay loam grassland, mostly fr. 9.12.1949, fl. after rain, 24.2.1950, occasional fl. mostly in bud, 4.8.1950, mostly fr. 24.11.1950, abundant fl. 28.9.1951. Recorded No. 5585, 6 miles W. of Yarrawonga (N.E. Vict.) along roadside drains, fl. and fr. 7.10.1951. Fl. irregular. Current observations suggest a localised distribution.

Var. **lanuginosa** (*Steetz*) *Benth.* 5580, Bulgandry Reserve, Bulgandry, in clay loam soil subject to periodical flooding, uncommon, 8.10.1951.

B. perpusilla (*Steetz*) *J. M. Black* var. **tenella** (*Turcz.*) *G. L. Davis.* 2047, 3473, 4779, Bulgandry Reserve, Bulgandry, plentiful in grassland, 20.9.1948, 29.8.1949, fl. 21.8.1950; 2014, Walbundrie, common in depression in open grassland, 17.9.1948; 3536, Comer Reserve, 6 miles S.W. of Henty, fairly common in barer ground of open grassland, 5.9.1949; 4842, Walla Walla, grassland, 23.9.1950; 4876, 2 miles S.E. of Balldale, in *Callitris* forest reserve, 24.9.1950; 1978, 3681, Jindera, on grassed ridge, 9.9.1948, on gravel ridge, 2.10.1949. Recorded No. 3573, Chiltern (N.E. Vict.), diffuse in loose soil of open forest land, 17.9.1949. Fl. Aug.-Oct.

Widespread and common, at least in areas west of a meridional line through Albury, in dried grassland and on stony ridges, less so as part of the ground cover in open forests. Often inconspicuous on account of its small size, yet search will reveal scores of plants within a few square yards.

Solenogyne *Cass.*

S. bellioides *Cass.* var. **gunnii** (*Hook. f.*) *G. L. Davis.* 5453, Paddy's River, Tooma, forming matted, interleaving rosettes in cleared grassland of open forest, 26.12.1950; 5612, Bulgandry Reserve, Bulgandry, grassland, little fl. or fr. 23.10.1951; 5624, Comer Reserve, 6 miles S.W. of Henty, barer ground of clay loam grassland, little fl. or fr. 25.10.1951; 5523, Showground Reserve, Culcairn, damp spots in grassland, fl. and fr. 31.10.1951. Recorded for Upper Murray River, 1887 (C. French, Jr.) by Davis (1950, p. 191). Fl. probably over an extended period since only a proportion of plants appear to be in fl. or fr. at the same time.

Not an uncommon species but inconspicuous in grasslands.

Stuartina *Sond.*

S. muelleri *Sond.* 2124, The Glen, Tumbarumba, grassland, 3.10.1948; 1157, Lankey's Creek, on grassy slope, early fl. 18.10.1947; 3575, Hovell Reserve, Burrumbuttock, moist clay margin of stock-tank, providing a large proportion of groundcover, 19.9.1949; 1975, Jindera, on grassed, stony slope, plentiful, 9.9.1948; 2547, Budgi Trig. Station Hill, Table Top, plentiful, fr. 10.11.1948. Observed to be plentiful in Balldale district, in bud 1.9.1949; early fl. Triangle Reserve, Brocklesby on 19.9.1949. Fl. Sept.-Oct.

Very widespread and common in the area with no specific habitat. Often prominent in heavily rabbit-infested country. In *Callitris* forests in the western section, it occurs in abundance together with a ground cover of *Crassula* spp. and mosses. A hardy species thriving on the driest sites of low fertility but present also in damp forests.

Gnaphalium *L.*

G. luteoalbum *L.* 443, Little Billabong, 4.1.1947; 630, Holbrook, common, 2.2.1947; 4431, Culcairn, along dam banks, mostly mature, 1.2.1950; 4439, Community Park, Howlong, occasional clumps, fr. 8.2.1950. Observed fl. East Henty on 24.2.1950; early fl. Mungabarina Reserve, Albury, on 2.10.1949. Fl. spring and summer.

Widespread and common; no specific habitat.

‡ **G. japonicum** *Thunb.* 1344, Mannus Gap, Tumbarumba, plentiful in forest, 2.1.1948; 442, Holbrook, 21.12.1946; 4437, Murray River flats, Howlong, occasional clumps, fr. 8.2.1950; 4530, Wymah Gap, uncommon in swamp, 28.2.1950; 4866, 2 miles S.E. of Balldale, in pine forest, early fl. 24.9.1950; 4748, Bake's Reserve, Gerogery, fl. and fr. 13.8.1950. Fl. spring and summer; to a small degree at other times.

Widespread over the area but of diffuse occurrence.

G. indutum *Hook. f.* Recorded, 3567, Chiltern (N.E. Vic.), in railway enclosure, 17.9.1949.

Cassinia *R. Br.*

C. longifolia *R. Br.* Recorded, 2750, Beechworth Road, Leneva (Vic.), occasional bushes, 4.12.1948.

C. aculeata (*Labill.*) *R. Br.* 2858, Tumbarumba Road, Laurel Hill, very common, about 3,000′, 27.12.1948; 445, Carabost, plentiful along roads, 28.12.1946. Recorded, 2943, Mount Stanley (Vic.), about 3,000′, 3.1.1949.

Common in montane areas in forest lands, rare or absent in areas under 1,000′.

Helipterum *DC.*

H. cotula (*Benth.*) *DC.* 2049, 3780, 5132, Bulgandry Reserve, Bulgandry, forming large, conspicuous patches up to 20 yards diameter, yellow flowers, 20.9.1948, end of fl. 14.10.1949, fl. 16.10.1950; 5121, Wallandool, near Urangeline, common in cleared *Callitris-Eucalyptus albens* grassland, 18.10.1950. Recorded, No. 5551, Oaklands, west of the area, common in clay loam soil subject to seasonal floodings, 27.9.1951. Fl. Sept.-Oct.

Confined to the loam soils in the western half of the area.

H. corymbiflorum *Schlecht.* 5137, 5545, 5695, Wallandool, near Urangeline, patch over ¼ acre of swampy depression off roadside, fl. 18.10.1950, early fl. 18.9.1951, mature material 12.11.1951. Recorded No. 5556, 4 miles N.E. of Coreen (west of the area), very common in swampy depressions off roadsides, 27.9.1951.

Confined to the western boundary of the area. A common species in the adjacent Daysdale, Coreen and Oaklands districts, at least along miles of roadways.

H. pygmaeum (*DC.*) *Benth.* 2052, 3482, 4759, Bulgandry Reserve, Bulgandry, scattered clumps in grassland, 20.9.1948, 29.8.1949, 15.8.1950; 3516, 3689, Cemetery Reserve, Henty, in grassland, 2.9.1949, 3.10.1949; 4906, Pleasant Hills, roadsides, 22.9.1950; 4944, Goombargana, common in grassland, 25.9.1950. Fl. Aug.-Oct.

Observed only in the loam soils in the western part of the area and there frequent in most natural grasslands.

H. demissum (*A. Gray*) *Druce.* 5007, Tunnel Road, Woomargama, abundant Albury, plentiful on gravelly ridge, 2.10.1949; 2091, Monument Hill, Albury, forming on bare, hard grounds of scrubland, 2.10.1950; 3684, Jindera Gap, 6 miles N. of clumps in dried-out depressions in hard ground, 27.9.1948. Fl. Sept.-Oct. Noted only at these localities.

H. incanum (*Hook. f.*) *DC.* var. **auriceps** *F. Muell.* 4001, Burra Road, Tumbarumba, single plant on roadside, fl. 8.11.1949; 2995, 3810, Nail Can Hill, West Albury, about 1,000′, common in scrub-land, end of fl. 22.1.1949, full fl. 17.10.1949. Fl. at least Oct.-Jan.

The above are yellow flowered.

H. australe (*A. Gray*) *Druce.* 5227, Adelong Road, Tumbarumba, abundant on roadsides, 26.10.1950; 2041, 2043, Bulgandry Reserve, Bulgandry, 20.9.1948; 2017, Walbundrie, common in grassland, 17.9.1948; 1085, Culcairn Road, Holbrook, 28.9.1947; 1182, Holbrook, 26.10.1947; 3520, Comer Reserve, S.W. of Henty, common in grasslands, 5.9.1949; 2517, 2752, Monument Hill, Albury, abundant 7.11.1948 fr. 5.12.1948. Fl. Sept.-Nov.

Very widespread and consistent over the area. Of no specific habitat, but found in grazing areas, forest, scrublands and swamps.

Helichrysum *Mill. corr. Pers.*

H. scorpioides *Labill.* 3961, 5156, The Glen, Tumbarumba, uncommon in open forest land, about 2,200′, fl. 7.11.1949, 24.10.1950; 4331, Mason's Hill, Tumbarumba, fairly common in open forest, end of fl. 28.12.1949.

H. bracteatum (*Vent.*) *Andr.* 5411, Pleasant Hills township, in *Acacia difformis* scrub, mature and immature fl. 11.12.1950; 5362, Brocklesby Road 2 miles W. of Burrumbuttock, patch in little-used lane, 16.11.1950; 2638, Monument Hill, Albury, plentiful in scrub and semi-cleared forest land, 21.11.1948. Recorded No. 2911, Mt. Stanley (N.E. Vict.), about 3,000′, 3.1.1949. Fl. at least Nov.-Dec.

Widespread but not now common.

H. apiculatum (*Labill.*) *DC.* 132, Carboona Gap, Tumbarumba, plentiful on rocky banks, 16.12.1946; 1136, Table Top, 9.10.1947; 4642, Blue Hill, S. of Henty, clumps in grassland, fl. 12.5.1950; 4217, Brocklesby, railway enclosure, abundant, fl. 1.12.1949; 2729, 3372, Monument Hill, Albury, abundant in scrub land, 5.12.1948, fl. but mostly fr. 18.6.1949. Observed in full fl., railway line at Burrumbuttock on 29.9.1949; early fl. Mungarbarina Reserve, Albury, 1.10.1949. Fl. irregular, mostly in spring but extending to late autumn, depending on seasonal conditions.

Very widespread and common. Forms showy masses along miles of railway lines, otherwise distributed in scrub and forest lands or little-used roads and lanes. Has been observed in the uncultivated margins of old cropping paddocks.

H. semipapposum (*Labill.*) *DC.* 3440, Pleasant Hills, dense clumps in cemetery, mature fl. 15.8.1949; 2688, Culcairn, clumps in railway enclosure, 26.11.1948; 3602, Burrumbuttock, roadsides, 23.9.1949; 3331, Gerogery, open grassland, fl. 7.6.1949. Fl. irregular.

Not as common as the preceding but of similar distribution and habitat.

Leptorhynchus *Less.*

L. squamatus (*Labill.*) *Less.* 4293, The Glen, Tumbarumba, common in grassland, mature fr. 26.12.1949, in bud with occasional fl. at same site on 7.11.1949; 1165, 2-Mile Reserve, Holbrook, in moist pasture, 11.10.1947; 2026, 2761, Monument Hill, Albury, plentiful in open forest land, 18.9.1948, mature fr. 5.12.1948; 3002, Murray River, Albury, diffuse on sandy flats, mature 22.1.1949. Fl. Sept.-Nov.

Very widespread and common. Of no specific habitat, moist forests, swamps, dry road embankments or sandy loam grasslands.

Millotia *Cass.*

M. tenuifolia *Cass.* 1996, Monument Hill, Albury, not common in bare, rocky ground, 12.9.1948. Earliest fl. at same site on 4.9.1949. Not observed elsewhere.

Rutidosis *DC.*

R. multiflora (*Nees*) *B. L. Robinson.* 4991, 4999, Talmalmo (Dora Dora), forming aggregations on barer and drier sites of roadsides, forest and scrub lands, 2.10.1950; 5603, Thurgoona, grassland, 16.10.1951; 1995, 2097, 3754, Monument Hill, Albury, in hard ground of swampy depressions, 12.9.1948, 27.9.1948, 12.10.1949; 3683, Jindera Gap, 6 miles N. of Albury, abundant in patches on gravel ridge, 2.10.1949. Fl. Sept.- Oct.

Plentiful at localities cited but not observed away from these rather diverse sites.

Toxanthes *Turcz.*

T. perpusilla *Turcz.* 4971, Coreen Hill, 7 miles N.W. of Coreen, abundant in barer ground of granitic outcrops, 29.9.1950; 4899, 5 miles N. of Henty, fairly common in grassland on rocky hillside, 22.9.1950; 4761, 4773, Bulgandry Reserve, Bulgandry, clusters in barer parts of red loam grassland, 15-21.8.1950; 4867, 2 miles S.E. of Balldale, diffuse in ground cover of *Callitris glauca* forest reserve, 24.9.1950; 4798, Morebringer, near Howlong in loam grassland at edge of *Callitris* woodland, 25.8.1950; 3642, Jindera Gap, 6 miles N. of Albury, forming masses similar to lichenous incrustations on dry gravelly ridge, 2.10.1949. Fl. Aug.-Oct.

Widespread and of diffuse occurrence on the loam soils of the western section of the area.

Podolepis *Labill.*

P. jaceoides (*Sims*) *Druce.* 3738, Gerogery, railway enclosure, plentiful, 11.10.1949; 2605, Howlong, in swampy land, 19.11.1948; 2615, Table Top, railway line, fr. 17.11.1948.

Inula *L.*

***I. graveolens** *L.* "Stinkwort". 722, Welaregang, roadsides, early fl. 17.3.1947; 486, Holbrook, 4.4.1947. Fl. summer and autumn.

Occurs up to acres in extent on rocky hillsides at Holbrook and various parts of the Upper Murray districts; otherwise sporadic patches in the wheat belt; here and there along the course of the Murray River. Common in many of the adjacent areas in N.E. Victoria.

Long established in the district as pointed out by Maiden (1920, p. 92): "In the *Herald* of 28th March, 1890, is the following telegram from Albury. It refers to

Stinkwort—A noxious weed new to this district has been found in the paddocks near Burrumbuttock." Maiden also quotes Mackay, Secretary of the Albury Pastures and Stock Board, writing on 15th March, 1894: "Stinkwort has only lately made its appearance," and a report from Walla Walla in May, 1895.

Myriocephalus *Benth.*

M. rhizocephalus (*DC.*) *Benth.* 3478, 5133, Bulgandry Reserve, Bulgandry, abundant in moist spots, 29.8.1949 to 8.9.1949, (in bud on 22.8.1950; end of fl. mostly fr. 14.10.1949); full fl. 16.10.1950; 3496, Oil Tree Lagoon, Balldale, plentiful in damp spots, 1.9.1949; 4185, Ryan, near Henty, uncommon in dry clay-pan, mostly fr. 3.12.1949; 1082, Culcairn Road, Holbrook, in clay of roadside drain, 22.9.1947. Fl. late Sept.-Nov.

A common species, particularly noticeable in early spring, often abundant in clay-pans of the western section, in swampy depressions in grasslands or roadside drains and ditches. Observed only in areas under 1,000′.

Calocephalus *R. Br.*

C. sonderi *R. Br.* Recorded, No. 5789, Urana Road, Rand, common along miles of roadways north-west of the area, 10.12.1951.

Gnaphalodes *A. Gray*

G. uliginosum *A. Gray.* 2048, 3784, 4778, Bulgandry Reserve, Bulgandry, in open grassland, fairly common, 20.9.1948, 14.10.1949, in bud, 21.8.1950; 4888, 5 miles N. of Henty, grassland, 22.9.1950; 5026, Walbundrie, dried parts of grassland, 4.10.1950; 4796, Morebringer, near Howlong, common in *Callitris* woodland, in bud 25.8.1950. Fl. Sept.-Oct.

Widespread over the western half of the area forming colonies on drier sites.

Craspedia *Forst. f.*

C. spp. 2850, Laurel Hill, 3,000′-3,300′, damp forest, 27.12.1948; 446, The Glen, Tumbarumba, in swamps, 26.12.1946; 1151, Carboona Gap, Tumbarumba, in swamp, 18.10.1947; 1172, 2-Mile Reserve, Holbrook, not common in swamp, 11.10.1947; 1158, Howlong, in swamps, early fl. 16.10.1947; 3502, Culcairn, along railway line, fl. 1.9.1949; 3669, Mungarbarina Reserve, Albury, common in marshy areas, 1.10.1949.

Widespread and common genus in swamps and moister areas. The genus is in need of revision.

Erechtites *Rafin.*

E. arguta (*A. Rich.*) *DC.* var. **arguta.** 5456, Paddy's River, Tooma, large patches in scrub along creek banks, 26.12.1950.

Var. **dissecta** *Benth.* 2703, 3378, Monument Hill, Albury, uncommon in scrub land, fl. 28.11.1948, little fl. 18.6.1949. Noted at Indigo Falls, Leneva (Vic.) Uncommon.

E. atkinsoniae *F. Muell.* 117, Tunnel Road, Woomargama, plentiful on roadsides, 21.12.1946.

E. quadridentata (*Labill.*) *DC.* 699, Carboona Gap, Tumbarumba, uncommon on roadside, 11.3.1947; 100, Sour Flat Reserve, Little Billabong, common weed, 14.12.1946; 5380, Jingellic, roadsides, 26.11.1950; 2686, Monument Hill, Albury, scattered distribution, fr. 28.11.1948. Recorded, 1692, Wodonga (Vic.), on railway embankment, 26.4.1948. Fl. Oct.-Dec., occasionally into autumn.

Widespread and common in the hilly and mountainous portions of the area.

Anthemis *L.*

* **A. cotula** *L.* "Stinking Mayweed". 2742, Albury Abattoirs Yard, early growth, 2.12.1948; 3210, Mungabarina Reserve, Albury, fl. 3.4.1949; 3003A, Murray River, Albury, diffuse in sandy river flats, 22.1.1949. Recorded, 2975, Wodonga Saleyards (Vic.), 15.1.1949. Fl. Dec.-Jan., often as late as April.

Widely spread and common along the course of the Murray River, covering acres of flats at Khancoban and Bringenbrong, resulting in infestations of the flood plain along the course of the river. Extends away from the Murray, a patch having been noted in the Tumbarumba township, fl. 12.1949. Hurst (1942, p. 403) records poisoning in calves suggested to be due to this species in the Carabost district.

Achillea *L.*

* **A. millefolium** *L.* 1341, Murray's Crossing, Tumbarumba, dense patches along creek bank, not fl. 2.1.1948; 335, Holbrook, garden, fl. 7.1.1947. Extensive patches are present in the Holbrook Cemetery. Observed fl. in Henty and Culcairn gardens on 28.4.1950.

Commonly cultivated, occasionally spontaneous.

Chrysanthemum *L.*

† **C. maximum** *Ramond.* "Shasta Daisy". 650, Tumbarumba, cultivated, 24.2.1947. Commonly cultivated.

Artemisia *L.*

† **A. arborescens** *L.* 392, Woomargama, cultivated, fl. 8.1.1947. A hardy species, commonly cultivated. Often persists on old homestead sites despite depredations of grazing stock. A favourite hedge plant, excellent examples are in evidence at Holbrook, Henty and Walla Walla.

Cotula *L.*

C. australis (*Less.*) *Hook. f.* "Cotula". 714, Holbrook, in moist dam drain, 9.3.1947; 1984, Monument Hill, Albury, abundant, 12.9.1948. Observed in early fl. at Albury on 23.8.1949; at Bulgandry on 22.8.1949, early fr. at same locality on 14.10.1949. Fl. Aug-March, probably most of the year in moist sheltered sites.

C. reptans *Benth.* 2564, Budgi Trig. Station Hill, Table Top, amongst granite rocks, mostly fr. 10.11.1948; 4828, Nail Can Hill, Albury, uncommon, on dry sites of hillside, fl. 11.2.1950.

Observed only at these sites.

C. coronopifolia *L.* "Waterbuttons". 3706, Henty Common,, occasional along moist clay margins of stock tank, 3.10.1949; 3206, Doctor's Point, Albury, not plentiful in road drain with tall herbage, fl. 3.4.1949; 5577, Rand, along roadsides mixed with *C. bipinnata*, fl. 8.10.1951.

Noted only at these localities. Certainly uncommon along the lagoons and marshes of the Murray River.

‡ **C. bipinnata** *Thunb.* 2065, Rand Road, Bulgandry, common on margins of shallow pools, 20.9.1948; 3804, 5098, Bulgandry Reserve, Bulgandry, common in marshy areas, 17.10.1949, 16.10.1950; 2601, 3493, Oil Tree Lagoon, Balldale, in claypans and swamps, 19.11.1948, 1.9.1949; 2642, Walbundrie Road, Culcairn, common in roadside claypans, 23.11.1948. Recorded No. 5555, 4 miles N.E. of Coreen, large patches, acres in extent along roadside, full fl. 27.9.1951. Fl. at least Sept.-Nov.

Well established in the western half of the area; very prevalent in the adjacent Daysdale, Coreen and Oaklands districts. Presumably spreading eastwards. Present only in moist sites or land subject to seasonal flooding.

Soliva *Ruiz et Pav.*

* **S. pterosperma** (*Juss.*) *Less.* "Jo-Jo". 1149, Lankey's Creek, immature, 18.10.1947; 4987, Talmalmo, roadsides, 2.10.1950; 5115, Wallandool, near Urangeline, grassland, 18.10.1950; 5131, Bulgandry, diffuse in grassland, 16.10.1950; 3644, Jindera Gap, 6 miles N. of Albury, occasional patches in moist grassland, 2.10.1949; 3751, Monument Hill, Albury, small patch in damp depression, not common, 12.10.1949; 3928, Albury Botanic Gardens, weed on patch, 2.11.1949. Fl. Oct.-Jan.

Widely spread throughout the area but not assuming the luxuriance seen in coastal grasslands of N.S.W.

* **S. stolonifera** (*Brot.*) *Thell.* 2781, 3778, Bulgandry Reserve, Bulgandry, clumps forming a continuous ground cover over bare ground, fr. very mature, 13.12.1948, fl. 14.10.1949; 3879, Walbundrie, abundant in homestead yard, 28.10.1949. Observed in various parts of the Pleasant Hills and Henty districts, particularly in homestead yards. Fl. Oct.-Nov.

As yet confined to the western (wheat) section of the areas.

Centipeda *Lour.* "Sneezeweed".

C. minima (*L.*) *A. Br. et Aschers.* 689, Wantagong, plentiful on roadside, 27.2.1947; 742, 10-Mile Creek, Holbrook, 23.3.1947; 3619, Burrumbuttock P.W.P. Tank, plentiful in moist clay, 23.9.1949; 4483, Murray River, Howlong, common along river bank, 22.2.1950. Fl. mainly summer.

Widespread and common.

C. cunninghamii (*DC.*) *A. Br. et Aschers.* 391, Yarrara Gap, Holbrook, 2.1.1947; 2567, Corowa Road, Rand, common on roadsides, 15.11.1948; 247, Henty, 4.1942; 4442, Murray River, Howlong, abundant along banks, 8.2.1950; 3004, Murray River, Albury, plentiful on sandy bank, 22.1.1949. Recorded, Brocklesby, 1.1931 (Albury P.P. Board, Office Records). Fl. Nov.-April.

Very widespread and common. Very hardy and withstands dryness well. However both this and the preceding species prefer damp situations, e.g., sandy creek banks, claypans and roadsides. Their profusion is partly explained by their unpalatability to stock, for they are rarely touched along the busiest stock routes.

Isoetopsis *Turcz.*

I. graminifolia *Turcz.* 2044, Bulgandry Reserve, Bulgandry, patches in damp depressions of grassland, 20.9.1948 (approaching fl. at this site on 29.8.1949); 3517, 3691, Cemetery Reserve, Henty, scattered patches in gravel of dam bank, 2.9.1949, 3.10.1949; 3521, Comer Reserve, 6 miles S.W. of Henty, fairly common in grassland, 5.9.1949; 2470, 9-Mile Hill, Albury, margin of grassland and gravel pit, uncommon, fr. 1.11.1948. Observed at Jindera Gap, Albury, fl. and fr. 2.10.1949. Recorded, 3564, Chiltern (N.E. Vic.), not plentiful in clay silt of railway enclosure, 17.9.1949. Fl. Sept.-Oct.

Widespread in grasslands and open forest land to the west of a meridional line through Holbrook. A hardy species, thriving on drier sites; very common but inconspicuous in spring pastures.

Arctotis *L.*

A. australiensis *Beauverd.* 1076, The Glen, Tumbarumba, fairly common in moist forest, 13.9.1947; 1850A, 9-Mile Hill, Albury, common, 4.9.1948 (earliest fl. at this site on 8.8.1949); 4752, Gerogery, railway line, fl. 13.8.1950. Observed in early fl. along railway line from Table Top to Culcairn, 8.8.1949; full fl. 15.8.1949; full fl. and abundant in forest at Tumbarumba, Laurel Hill and Batlow on 7.11.1949. Fl. Aug.-Nov., probably later at higher elevations.

Widespread and common in bush and forest lands and along railway lines, uncommon in grazing lands. Observations would indicate that it is not palatable to rabbits or stock.

Gazania *Gaertn.*

† **G. rigens** (*L.*) *R. Br.* 2668, Albury, garden, 21.11.1948. Hardy species, commonly employed as a border plant or in rockeries in Albury gardens.

Cryptostemma *R. Br.*

* **C. calendula** (*L.*) *Druce.* "Cape Weed". 1097, Holbrook, common pasture weed, 28.9.1947; 3552, 3759, Monument Hill, Albury, early fl. 4.9.1949, fl. and early fr. 12.10.1949. Earliest fl. material in Howlong and Brocklesby districts on 1.9.1949, 31.7.1950; Henty district, 4.8.1950; full fl. Albury district on 14.9.1949, end of fl. 4.12.1949. Fl. mainly Sept.-Dec., to a small degree as early as July.

Very widespread and common in settled areas. Often forms the dominant constituent of herbage with "Crowfoot" (*Erodium* spp.) around homesteads and stockyards in late spring.

The *Border Post* of 14.10.1868 records with regret "the introduction to Albury of another plague for farmers. We allude to the cape weed, patches of which may be seen growing along the sides of Dean Street and putting forth the well-known bright yellow flowers, somewhat resembling the marigold. Anyone who is familiar with the appearance of the roadsides and paddocks about Melbourne at this season of the year will be able to appreciate the mischief this weed is capable of doing. Quite as bad, if not worse than the burr, thistle and dock or sorrel, the cape weed chokes all other vegetation, and like a female's crinoline, 'spreads considerable'. We can only account for the visitation by supposing that a few stray seeds of the cape weed have been brought up from Melbourne or other places by cattle or horses."

By 1883 the Albury Borough Council in discussing noxious weeds noted that the Cape Weed has already established itself in several parts of the municipality and some action should be taken at once (*Border Post,* 28.11.1883).

Xanthium *L.*

* **X. spinosum** *L.* "Bathurst Burr". 395, Ournie, 27.1.1947; 485, Holbrook, 4.4.1947; 4464, Waterworks Reserve, Albury, fl. 10.2.1950. Observed mainly fruiting on railway line, Albury, 30.4.1950; mature fr. Henty district, 12.5.1950. Fl. summer and autumn.

Widespread, tending to diffuse distribution with no areas of any quantity. The greatest concentrations are found in settled areas, and the fleeces of sheep in late summer are often loaded with the burrs.

Indications are that this weed first appeared in the area about 1854, as a correspondent, "Farmer", from Indigo to the *Border Post* of 13.5.1863 remarked:—"Some nine years back Major Stewart of Bathurst drove a mob of cattle through Barnawartha to the lower diggings. Through this it is supposed the renowned Bathurst

Burr was introduced to the district. The soil seems to agree with it and it is flourishing everywhere". A correspondent to the *Sydney Herald,* quoted in the *Border Post* of 9.1.1858, considers:—"It is six years since the Bathurst Burr made its appearance on the Murrumbidgee flats". On a recent visit (about 1858) the observer saw "burrs and thistles increased to a fearful extent—about Jugiong and Gundagai, the whole of the flats are covered with these plants". Prior to this, William Howitt in "Land, Labour and Gold" describes Albury to the end of 1852 as exhibiting in cultivated land, "Bathurst Burr (*Xanthia Spinosum*)—a plant with long triple spines like the barberry, and burrs very ruinous to the wool. Otherwise itself very like a chenopodium or good fat hen" (Andrews, 1912, pp. 19-20). In 1862 a complaint from Albury residents was presented in Sydney and a request was made for a bill to provide for the destruction of Bathurst Burr and Scotch Thistle (Andrews, 1912, p. 47).

The burr problem was in evidence in 1857 when the Albury Agricultural and Horticultural Society moved at a meeting—"the desirability of taking steps to prevent the spread of Bathurst Burr" (*Border Post,* 25.2.1857). By 1866 the *Border Post* (28.2.1866) observed, "the roadmen of the Albury Council busy eradicating the burrs".

* **X. pungens** *Wallr.* "Noogoora Burr". Recorded on the Bridge Reserve, Howlong, but eradicated.—J. Esler, Hume Shire Council (p.c.).

Sigesbeckia *L.*

S. orientalis *L.* Recorded, 1822, Indigo Falls, Leneva (Vic.), fairly common in open forest land, 23.5.1948. This site is some 18 miles S. of Albury. Observed at Bungowannah along Murray River flats.

Eclipta *L.*

E. platyglossa *F. Muell.* 4450, 4452, Lockhart Road, 3 miles N.W. of Rand in mud of roadside drains, fl. and fr. 9.2.1950.

Coreopsis *L.*

† **C. tinctoria** *Nutt.* 1411, Albury, garden, 14.2.1948. Commonly cultivated; occasionally spontaneous on rubbish heaps in the Albury district.

Verbesina *L.*

* **V. encelioides** (*Cav.*) *A. Gray.* "Crown Beard". 840, 1020, Culcairn Road, Holbrook, isolated plants on roadside, fl. 5.4.1947, 1.5.1947. Uncommon.

Rudbeckia *L.*

† **R. laciniata** *L.* var. "Golden Glow". 638, Tumbarumba, garden, 12.2.1947. Commonly cultivated.

Zinnia *L.*

† **Z. elegans** *Jacq.* 494, Holbrook, garden, 6.4.1947. Commonly cultivated. Occasionally spontaneous on rubbish heaps.

Helenium *L.*

† **H. autumnale** *L.* 646. Tumbarumba, garden, 12.2.1947. Commonly cultivated.

Cirsium *Mill.*

* **C. vulgare** (*Savi*) *Ten.* "Black" or "Spear Thistle". 633, Holbrook, plentiful, 3.1.1947; 3816, Goombargana Hill, early fl. 18.10.1949. Fl. irregular.

Widespread and well established over the whole area, covering acres of ground in many parts. Effectively employed as a basis of thistle-root and strychnine rabbit poison baits. The optimum time for rabbit poisoning is the late summer, and there may then be a scarcity of the necessary roots in the rosette stage of growth. However, summer rains may produce a profusion of suitable roots within a period of three weeks. Cases have been seen of irrigation for this purpose. Heavy infestations in paddocks are often associated with the agistment of itinerant cattle.

Undoubtedly long established in the area but early records as quoted under *Xanthium spinosum* may refer to *Silybum marianum* rather than to this species.

Carduus *L.*

* **C. pycnocephalus** *L.* "Slender Thistle". 588, Woomargama, 12.1.1947; 3897, Burrumbuttock, large clump on site of old fire, 28.10.1949. Observed to be common at Jindera Gap, little fl. 19.9.1949. Abundant fl. material at Gerogery on 29.9.1949 and at Burrumbuttock, 23.9.1949. Fl. Sept.-Jan.

Widespread but occurring in sporadic clumps in various localities.

Silybum *Gaertn.*

* **S. marianum** (*L.*) *Gaertn.* "Variegated Thistle". 2765, Burrumbuttock, large clumps, 3.12.1948. Very common on river flats from Jingellic to Welaregang, ascending to the Tumbarumba area, where it has been implicated in stock poisoning. Sporadic at Wolseley Park and Mannus where it is locally known as "Gundagai Thistle". Observed at numerous diverse areas; plentiful in patches of up to half an acre at Bungowannah, not fl. 19.9.1949; Little Billabong and Walla Walla, fl. 29-30.11.1949; Brocklesby Railway Station, fl. 1.12.1949; Albury City Area, fl. 6.1.1950. Fl. Oct.-Jan.

Widespread and common over the whole area, reaching maximum development on moist, rich, alluvial soils of high fertility, otherwise in damp situations. Involved in nitrate-nitrite poisoning in livestock, especially in the early green growth.

Most references to thistles in the early records appear to be to this species. Judging from the present distribution it is evident that it has been established since the early days of settlement. The *Border Post* of 10.1.1857 observed: "incalculable mischief has been done during the past few days by the shedding of seeds of several gigantic thistles growing on the flat near the brickfield (Albury). We pointed out the evil before when the seeds were ripe."

'Traveller' when passing through the Upper Murray district remarked (*Border Post*, 15.11.1879) that "it would seem that the Scotch Thistle had been carefully sown here, as there is quite a bed of this pest all along the bank of the road". Luke Gulson in the same region noted "the open flats of the Murray River at Ournie, where the thistles abound", being the favourite haunt of skilled sportsmen (12.2.1886); and in the issue of 5.3.1886 saw on a drive from Towong to Tintaldra—"large, open flats, covered at this time of the year with the dead hulms of last season's thistle crop; the real old Scotch emblem that Burns' love of country would not let him destroy. The thistle seed is turned to some account here, as horses, cattle and sheep all eat it and flocks of fat turkeys are continuously met with, whose principal food is thistle seed." This species is, of course, not the true "Scotch Thistle" (*Onopordum acanthium*) which is not recorded for the area.

Centaurea *L.*

* **C. melitensis** *L.* "Cockspur". 3090, Henty Cemetery, not common, 18.2.1949; 121, Holbrook, common on roadsides, 13.12.1946; 2553, Table Top, railway embankment, 9.11.1948; 3859, Brocklesby Road, Burrumbuttock, occasional, early fl. 26.10.1949.

Widespread. Well established in the wheat areas, especially in old cultivation paddocks, but appears to be dying out.

* **C. solstitialis** *L.* "St. Barnaby's Thistle". 119, Holbrook, 10.12.1946; 1408, Gerogery, 12.2.1948; 4216, Brocklesby, railway enclosure, abundant, 1.12.1949; 3220, Table Top, fairly plentiful on roadside, 8.4.1949; 4476, Lockhart Road, Rand, roadsides, fl. and fr. 9.2.1950.

Widespread and common, at least in the western section of the area. Probably long established in the area in view of its proclamation for the Wodonga Shire in 1899 (see Ewart, 1909, p. 37).

* **C. calcitrapa** *L.* "Star Thistle". 389, Garry Owen Reserve, Holbrook, 18.1.1947; 3091, Henty Cemetery, not common, 18.2.1949; 4262, Bake's Reserve, Gerogery, occasional, in bud only, 14.12.1949; 3053, Mungabarina Reserve, Albury, fairly common on roadside, 16.1.1949. Observed occasionally along Murray Valley Highway, Wodonga to Yarrawonga (Vic.), fl. 26.1.1950; fl. at Dight's Hill, Albury on 30.12.1949; occasional plants fl. on roadsides in Henty and Ryan districts on 2.12.1949. Fl. Dec.-Feb.

Widespread but of diffuse distribution, sporadic clumps occurring here and there.

† **C. cyanus** *L.* "Cornflower". 4277, Albury, cultivated in garden, fl. 17.12.1949.

Acroptilon *Cass.*

* **A. picris** (*Pall.*) *DC.* "Russian Knapweed". Recorded for Henty in lucerne patch by Blakely (1924b, 1922a) as *Centaurea picris*. Recorded in the minutes of the to the New South Wales Department of Agriculture.

Carthamus *L.*

* **C. lanatus** *L.* "Saffron Thistle". 3257, The Glen, Tumbarumba, in pasture, fl. 24.4.1949. Observed, early fl., Walla Walla and Brocklesby districts on 30.11.1949; abundant fl. Gerogery district, 1.2.1950; mostly browned off with occasional fl., Albury area, 24.3.1950; mostly fr. with occasional fl., roadsides, Walbundrie, 12.5.1950. Fl. Nov. to midsummer with a small percentage into the autumn.

Very prevalent in old cultivation lands in the wheat areas, often forming impenetrable thickets in paddocks during summer. Less common in purely grazing areas. The seeds are of acknowledged food value, but the plants act as refuge for rabbits. The spines and bracts may cause trauma and are therefore involved as aetiological agents in the incidence of Contagious Pustular Dermatitis and gas gangrene infections (*Clostridia* spp.) in sheep.

Maiden (1894, p. 300) referring to the Saffron Thistle (as *Kentrophyllum lanatum*) quotes the Secretary of the Albury Pastures and Stock Board: "The star thistle is all over the district in patches". Considered as one of the worst weeds of the district at a meeting of the Lankey's Creek (Jingellic), Agricultural Bureau as reported Culcairn Shire Council meeting of 12.2.1951 following submission of a weed specimen in Ag. Gaz. N.S.W., XXVI (1915) 722.

Hemizonia *DC.*

* **H. pungens** *Torr. et A. Gray.* "Spike-weed". Recorded for Walbundrie by A. A. Hamilton (1918).

Solidago *L.*

† **S. canadensis** *L.* "Golden Rod". 4352, Holbrook, garden, fl. 10.1.1950. Commonly cultivated.

Cichorium *L.*

* **C. intybus** *L.* "Chicory". 1368, Welaregang, scattered along roads, fl. 22.1.1948; 3103, Noreuil Park, Albury, uncommon, mainly fr. 20.2.1949.

Observed scattered in parts of the Upper Murray, notably Khancoban and sparingly distributed along the neighbouring Murray Valley Highway, Wodonga to Yarrawonga, fl. 26.1.1950. Widespread.

Microseris *D. Don*

M. forsteri *Hook. f.* 3962, The Glen, Tumbarumba, fairly common in open forest land, fl. 7.11.1949; 1942, 2024, Monument Hill, Albury, abundant, 4.9.1948, 18.9.1948.

Observed to be plentiful in forest lands at Woomargama; fl. at Jindera Gap on 2.10.1949; end of fl., Nail Can Hill, Albury on 15.10.1949. Fl. Sept.-Nov.

Widespread in forest and scrub lands throughout the area.

Hedypnois *Schreb.*

* **H. rhagadioloides** (*L.*) *Willd.* ssp. **cretica** (*L.*) *Hayek.* 3777, Bulgandry Reserve, Bulgandry, in grassland, occasional, fl. and early fr. 14.10.1949; occasional fl. and early fr. at this site on 24.7.950, with abundant fl. and fr. 15.8.1950; 3884, Walbundrie, cultivation paddocks, 28.10.1949; 3701, 4647, 4740, Cemetery Reserve, Henty, plentiful on roadsides and grasslands, fl. and early fr. 3.10.1949, fl. and fr. 9.6.1950, 4.8.1950; 3601, Burrumbuttock, fairly plentiful along railway line, fl. and early fr. 23.9.1949; 3860, Brocklesby Road, Burrumbuttock, common on roadsides, mostly fr. 26.10.1949; 2616, Brae Springs, Gerogery, 17.11.1948; 3922, Table Top, roadsides, mostly fr. 4.11.1949. Fl. Aug.-Nov., otherwise occasionally to a slight degree throughout the year.

Widespread, at least over the western section of the area and particularly well-established in grasslands in the wheat areas.

Hypochoeris *L.*

* **H. radicata** *L.* "Catsear", "Flatweed". 466, 811, The Glen, Tumbarumba, along roadsides and in pastures, 25.12.1946, fr. 5.4.1947; 338, Tumbarumba, 26.12.1946; 1113, 10-Mile Creek, Holbrook, 12.10.1947; 2629, Monument Hill, Albury, 21.11.1948. Observed, abundant fl. in Gerogery and Culcairn districts on 11.10.1949, Rand and Burrumbuttock areas on 14.10.1949, small amount of fl. material on railway line at Albury on 30.4.1950; do. Henty district on 12.5.1950. Fl. Sept.-Jan., mostly Oct.-Dec., but often into the autumn with a small degree for the remainder of the year.

Very widespread and common throughout the area, giving a yellow bloom to grasslands in late spring.

* **H. glabra** *L.* 3952, The Glen, Tumbarumba, common in grassland, fl. 7.11.1949; 3652, 9-Mile Hill, Wagga Road, Albury, early fl. 2.10.1949; 3678, Jindera Gap, on gravel, 2.10.1949; 3744, Monument Hill, Albury, abundant fl. and fr. 12.10.1949.

Recorded, 4174, Hume Highway, Tarcutta, road embankment, mostly fr. 28.11.1949. Observed in early fl., Laurel Hill, 7.11.1949; Culcairn on 14.8.1950; Rand and Brocklesby districts on 19.9.1948. Fl. Aug.-Nov., possibly later at higher elevations.

Widespread and common with similar habitats to those of *H. radicata* and as plentiful. Often dwarfed in dry sites, e.g., gravel beds.

Tragopogon *L.*

* **T. porrifolius** *L.* "Salsify". 2692, Bell's Road, Gerogery, not common on adjacent railway embankment, 26.11.1948. Uncommon.

Picris *L.*

* **P. hieracioides** *L.* Recorded for Mt. Stanley (N.E. Vic.), about 3,300′, plentiful, 3.1.1949. Not observed within the area.

Taraxacum *Wigg.*

* **T. officinale** *Weber.* "Dandelion". 3982, Tumbarumba, street gutter, fr. 8.11.1949; 3040, Albury Botanic Gardens, shady spots, 26.1.1949. Observed at Horse Shoe Lagoon, Albury, early fl. 7.10.1949; Bulgandry Reserve, Bulgandry, in bud 14.10.1949.

Widespread but nowhere observed to be common outside the Albury City Area.

Lactuca *L.*

* **L. saligna** *L.* "Wild Lettuce". 1359, Culcairn-Holbrook railway line, early fl. 10.1.1948. Observed only at this site.

* **L. serriola** *L.* "Prickly Lettuce". 308, Billabong Creek, Holbrook, 3.1.1947; 1689, Albury, garden weed, 24.4.1948. Fl. summer and autumn.

Very common and widespread ruderal species; about towns and railway embankments, even in cracks of pavements of busy thoroughfares.

Sonchus *L.*

* **S. oleraceus** *L.* "Milk Thistle". 4451, Lockhart Road, Rand, in culvert drain, 9.2.1950; 3545, Gerogery, in railway enclosure, 2.9.1949. Recorded, Ebden (N.E. Vic.), along railway lines, fl. and fr. 9.7.1950. Fl. all the year.

Widespread and common, particularly abundant in gardens, otherwise in waste places.

* **S. asper** (*L.*) *Hill.* "Rough Sowthistle". 5340, Munderoo South, Tumbarumba, occasional plants in stock reserve, fl. 12.11.1950; 4810, Balldale, common on roadsides, fl. and fr. 25.8.1950; 5632, 6 miles S.W. of Henty, along creek banks, 25.10.1951; 4695, Ebden (N.E. Vic.), along railway line, fl. and fr. 9.7.1950.

Widespread and frequent in the area. Often forming stands along roadsides in the wheat areas or along stream banks.

Crepis *L.*

* **C. capillaris** (*L.*) *Wallr.* 4305, Tumbarumba, common on roadsides, full fl. 27.12.1949; 339, 2867, The Glen, Tumbarumba, garden weed, 26.1.1947, 25.12.1948; 441, Holbrook, 21.12.1946; 1281, Towong on Murray River, in swamp, 12.12.1947. Fl. summer.

Widespread as indicated by localities cited but incidence unknown.

* **C. foetida** *L.* 5367, Ryan, near Henty, in grassland, fl. and fr. 21.11.1950. Recorded from Jingellic, 2.1948 (Albury P.P. Board Office Records).

Chondrilla *L.*

* **C. juncea** *L.* "Skeleton Weed". 587, Welaregang, 27.1.1949; 337, Cookardinia, 7.1.1947; 3187, 9-Mile Hill, Albury, 25.3.1947. Occasional fl. observed in Henty district on 12.5.1950.

Widespread and very common in the wheat areas, in some parts covering up to 90% of the cultivation lands. Of sporadic and diffuse distribution in the eastern half of the area. Reputed to have first appeared in the wheat belt during the early 1920's and become well established by 1930.

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A Revision of the Australian Species of *Danthonia* D.C.

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INTRODUCTION.

The present revision was undertaken in an attempt to remedy the very unsatisfactory state of our knowledge of the genus *Danthonia* in New South Wales, and to unravel the confusion which existed in the collections at the N.S.W. National Herbarium. It was soon evident that progress could not be made until representative collections from the whole range of the genus in Australia could be examined and compared, and hence the co-operation of the Herbaria of other States was sought and generously given. Examination of these collections showed that the confusion was not restricted to N.S.W., and that throughout Australia specific epithets were being applied with little regard for either natural relationships or nomenclature. This situation also existed to some extent in the overseas herbaria seen. The confusion was due in part to mis-application of epithets of which the Types were in overseas herbaria and not readily available to Australian botanists, and in part to a lack of appreciation of what constitute fundamental characteristics in the genus and to the over-emphasis of characters of little diagnostic significance.

The genus *Danthonia* is widely distributed in temperate regions of the world. It occurs in South Africa, South America, Australia and New Zealand in the southern hemisphere, and in Southern Europe, Asia and North America in the northern hemisphere. Species occurring in more tropical regions are usually restricted to montane areas, as in India and New Guinea.

In Australia the species occur almost entirely south of latitude 25°, and are most abundant towards the southern parts of the continent and in Tasmania.

The first Australian species were described from Tasmania by Labillardière (Nov. Holl. Pl., I, 1804), who referred them to the genus *Arundo*, as *A. penicillata* and *A. semiannularis*. In 1810 Robert Brown recognised eight species of the genus *Danthonia* based on his own collections. With one of these, *D. racemosa*, he doubtfully placed Labillardière's *Arundo penicillata*, his doubt preventing the invalidation of his species. He transferred *Arundo semiannularis* to *Danthonia*, and his combination remains based on Labillardière's Type. Examination of Brown's specimen at the British Museum of Natural History, however, shows that this was quite a different species from *D. semiannularis*, and so commenced the confusion which has surrounded this perhaps more than any other epithet applied to Australian species of *Danthonia*. In 1812 Beauvois transferred *Arundo penicillata* to *Danthonia*, but wrongly credited the combination to Robert Brown who had not effected it.

Trinius (Sp. Gram., 1823-36) illustrated three Australian species. Of these, *D. pilosa* R. Br. and *D. pallida* R. Br. appear to have been correctly interpreted, but the species figured as *D. semiannularis* appears to be similar to that erroneously referred to that species by Robert Brown, not to the *Arundo semiannularis* figured by Labillardière.

Five species are enumerated by Hooker in the Floræ Tasmaniæ II (1860), 120-121 (excluding the two species now referred to *Amphibromus*). *D. pilosa* and *D. pauciflora* appear to be correctly interpreted. His *D. subulata* is a slender plant of

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true *D. setacea* R. Br. Search for specimens named by Hooker at Kew revealed only one sheet he had named *D. setacea* (an unnumbered collection by Gunn from Marlboro', 1841) of which *D. laevis,* and two sheets he had named *D. semiannularis,* of which one (Gunn No. 1457) is correctly placed and the other (Recherche Bay, 1858) is *D. pilosa.*

In the succeeding years a number of species was described by European botanists, and, in Australia, by Ferdinand von Mueller. In 1873, owing to difficulty in discriminating between many of the described species and to the undoubted variation of many of them, Mueller united some sixteen Australian and New Zealand species under *Danthonia penicillata,* an over-simplification which for a long time appears to have hindered critical study of the genus.

Bentham (Flora Australiensis, VII, 1878) recognised eleven species. I have examined most of the specimens cited by Bentham and others named by him, and observed the difficulties which had become apparent in satisfactorily relating species by that time. In view of the importance of the Flora Australiensis as a standard reference for Australian botanists, a brief analysis of the specimens cited by Bentham under each species is appended to the descriptions wherever relevant in the enumeration of species.

The present revision is based on examination of a large number of herbarium specimens, of which a substantial proportion but by no means all are cited in the enumeration of the species. Study of herbarium specimens has been supplemented by field observations as far as practicable. Type specimens or fragments thereof have been examined of almost every species and variety, and details of these are given in the enumeration of species.

In Australia the genus is important economically over vast areas of natural grasslands not yet brought under systems of pasture improvement and in areas not suitable for such improvement it will probably remain so. It has been the general experience that the mechanical disturbances and application of fertilisers involved in pasture improvement operate to the detriment of the *Danthonia* population, and the species disappear from or diminish in areas so treated. Several species are among the more palatable and nutritious of the native fodder grasses in southern parts of the continent and are sufficiently numerous and of sufficient bulk to form a significant element of the pastures. The genus has therefore received some attention from ecologists and agronomists, and it is a matter for regret that the confusion in the taxonomy of this genus has resulted in wrong usage of specific epithets for some of its important constituents. As it is, reports of the occurrence of various species in the area studied must be treated with reserve unless subsequently confirmed. In particular this applies to "*Danthonia semiannularis*", since this name has been used for almost any but the true species. A detailed discussion of its typification is given under this species in the enumeration of species.

Though it is improbable that many species remain to be described, this is by no means certain, as collections examined from Western Australia and Tasmania in particular are not numerous, and several forms are still felt to be unsatisfactorily placed. Many collections from South Australia are similarly felt to be unsatisfactorily placed and it is possible that taxonomists with more abundant material and local field knowledge may feel justified in recognising varieties and species amongst forms which have at present been relegated to their nearest allies. To no "species" does this apply more than to *D. caespitosa* as recognised in this revision. *D. caespitosa* was described from Western Australia, and ranges from the western coast of that State across the full breadth of the continent to the coast of eastern Australia with its greatest development in the moderately dry to dry areas. Ranging over such a vast area and variety of habitats, it is perhaps to be expected that opportunity has been afforded it to form many variants which have not become completely differentiated. It is felt that the present treatment of its variants as one species is unsatisfactory, but it has not been possible to delineate natural groups based on consistent morphological differences either with or without geographic justification.

From the taxonomic standpoint the genus *Danthonia* in Australia suggests a state of evolutionary instability, in which speciation may still be in progress and by no means complete. While the populations here acknowledged as species appear to be reasonably recognisable entities, the degree of variation is high, and the number of intermediate forms found, though small in proportion to the total number of samples examined, is by no means negligible.

Definition of the "species concept" has been the subject for discussion by many able writers over a long period, and the difficulties of adequate definition and the variability of concept amongst different authors are well known. No theoretical discussion of this problem is needed here, but it is felt that an explanation is required as to the nature of the populations accepted as "species" in this paper. Generally speaking the existence of discontinuity between species is accepted as the most reliable criterion for their recognition, but not all biological populations show discontinuity, and the taxonomist is faced with the problem of interpreting the populations in a manner which will provide the most practical tool for study by taxonomic and non-taxonomic workers. The present revision is based on a compromise which accepts practical needs as of vital importance at the present stage of our knowledge of the genus, and falls short of the ideal of absolute discontinuity. Complete discontinuity probably does exist in the case of certain species, notably *D. bipartita*. For the majority the rank of species has been accepted when the material studied has revealed the existence of extensive populations of closely related individuals with similar morphological characters varying in minor ways about a norm, but showing occasional divergences towards one or more other species. It is considered that to decline to recognise these large populations specifically on idealistic grounds would achieve no more useful results and would lead only to the disadvantage of a cumbersome system of infra-specific nomenclature. The difficulties of uniting these populations into larger coherent groups would be almost insuperable.

In Figure 33 an attempt has been made to illustrate graphically and in a purely qualitative way the degree of discontinuity or convergence which has been noted amongst the various species.

Field observations and the examination of many specimens have led to the opinion that within many of the recognised species there exist numerous strains, and this may be of considerable interest to the field worker or agronomist attempting to select forms of particular qualities for propagation, but in the present work no special study of these strains as such has been made. The object has been rather to correlate them into units approximating to an acceptable specific unity. The study of strain differences can be best carried out on living plants in the field or in plot trials.

Inter-specific variation may be due to linear divergence from a common stock or to hybridization between units of different lines of divergence. Cashmore (Comm. Austral., C.S.I.R. Bull. 69, 1932), who carried out field plot trials on several species and strains of *Danthonia* at the Waite Agricultural Research Station, Adelaide, states that he found no case of hybridization amongst the material studied. The statement can be readily accepted as applying under the conditions under which the trials were made, but it cannot be assumed from this that hybridization could never occur. According to Cashmore, the flowers are normally self-fertilised, and in some strains cleistogamous. The morphological appearance of the florets in a few specimens among a wide range of herbarium material has also suggested to me that cleistogamy often obtains, but that it is doubtful whether any species is regularly cleistogamous. The anthers appear to be exserted in most species when the flowers are developed at a period of active and vigorous growth, but when panicles are produced at a season other than the main flowering period, or when the plant has been subjected to less than optimum conditions, the stamens are often found to be included. In the latter, well developed grains are less frequently noted. Cashmore does not state the nature of the experimental exidence upon which he bases the conclusion that the flowers are self-fertilized, but where extrusion of the anthers occurs cross-pollination must be considered as a possibility. In taxonomic studies of herbarium material alone it is difficult to obtain definite evidence for or against the occurrence of hybridization. Hybridization offers a convenient explanation of inter-specific variability, and its likelihood is suggested by some of the morphological evidence in *Danthonia*. However, in the absence of direct evidence, comparative morphology cannot be accepted as proof of the regular occurrence of hybridization. It is desirable that an experimental approach should be made by geneticists to the problems posed by the genus, and the ease with which species may be hybridized artificially determined, and hence whether natural hybridization may be expected with any degree of frequency in the field. The genus should provide a fertile field for investigations of this nature.

Grazing and other ecological conditions exert a marked influence on the plant, especially as regards size and appearance of the tussock, and to a considerable degree on the size of the panicle and number of spikelets, and also to some lesser extent on the size of the spikelets and lemmas. A tussock which has been closely eaten down and has subsequently grown out from the edges and produced a few sparse panicles near ground level may present a very different aspect from another of the same species which has grown perhaps under the shelter of some spinescent shrub or in an otherwise protected area, and shows an erect tussock and tall culms with many-flowered spreading panicles. Seasonal and edaphic factors exert a similarly marked influence. Every allowance must be made for this kind of variation both in the field and in the herbarium.

To a limited extent speciation may have proceeded or be proceeding in relation to environmental conditions, but the degree to which genetic barriers to interbreeding have been developed is uncertain. In those cases where this possibility exists it has been considered convenient to accord specific rank to what may prove to be ecological forms, pending more extensive knowledge of their relationships. Thus *D. alpicola* suggests an alpine counterpart of *D. caespitosa*. Again, *D. nudiflora* suggests a modification of *D. pilosa* induced by partial isolation and selection in a more alpine habitat. On the other hand *D. nivicola* suggests a reduction from a form such as *D. nudiflora*, yet is co-existent with it in sub-alpine communities.

A study of the genus suggests that geographic speciation has been one of the numerous factors influencing its development in Australia, though it does not seem to account for many of the problems presented. Thus *D. monticola* suggests a northerly counterpart of *D. geniculata*, perhaps after admixture with genes of a species such as *D. purpurascens*. *D. linkii* suggests a northerly counterpart of *D. richardsonii*, but there is a considerable overlap in their ranges. *D. longifolia* seems to be a northerly development from *D. semiannularis* and its discontinuity to be still imperfect or in doubt. *D. purpurascens* may be an eastern development from *D. caespitosa*, though their ranges overlap. On the other hand it has not been possible to account for variation in *D. caespitosa* on a purely geographic basis. While some forms seem to be characteristic of particular areas, a wide range of morphological variations may be found over the whole of its extensive range. These characteristics have not been found to show a simple relationship between gradual morphological change and geographic distribution as has been observed for certain species of other genera.

Specimens cited in the enumeration of species include those which may show a minor degree of variation from the norm, but marked variations and intermediates have not been cited in the belief that they represent problems best left for resolution by subsequent workers and perhaps by the application of other techniques. Their inclusion could well lead to further confusion. Under *D. caespitosa,* however, a wide range of variation has been admitted since this appears to represent the existing population in that species.

Evaluation of Diagnostic Characters.

The selection of characters of diagnostic importance for discrimination between species has been found to be peculiarly difficult in *Danthonia,* at least amongst the Australian species. The high degree of variation mentioned above renders it difficult to enunciate clear-cut qualitative or quantitative differences which will be applicable under all circumstances. An attempt is made here to describe and evaluate the characters which may be used as a guide to specific identity.

HABIT. The Australian species are all caespitose in habit, but vary considerably in average height and bulk. However this character is one on which the influence of habitat may impress itself to an extreme extent, so that its value diagnostically is limited, especially amongst species of moderate size. *D. pallida* is typically tall and robust, forming large tussocks. *D. carphoides* and *D. auriculata* are characteristically short in habit, seldom exceeding 12-25 inches, and *D. nivicola, D. nudiflora* and *D. pauciflora* are similarly low-growing. Amongst many other species full allowance must be made for the dwarfing effects of grazing, drought, inferior soil conditions and exposure, or for the drawing effects of lush conditions or shelter from stock. In the accompanying descriptions, notes on the habit and height of the plant are based on reasonably well developed specimens. *D. duttoniana, D. richardsonii* and *D. linkii* tend to produce more leafy tussocks than do certain other species co-existent with them, but again the difference can scarcely be expressed quantitatively for diagnostic purposes. In habit *D. bipartita* is distinctive on account of the woolly rootstock. The large tussocks and broad persistent leaf-bases of *D. frigida* are unusual amongst Australian species, its habit being more characteristic of a group of New Zealand species.

LEAVES. The sheaths offer little of diagnostic significance, except in the case of *D. frigida* as mentioned above, though the degree of hairiness may occasionally be a helpful if unreliable character.

The ligules are characteristically shortly ciliate, often with a few longer cilia at the margins. Variation in detail may be as great within the species or even on the one specimen as it is between species, and little help can be obtained from this feature.

Characters of the blades, such as length, breadth, flatness, and hairiness may offer some guidance, but must be treated with restraint, as considerable variation may occur, doubtless to some extent reflecting conditions of the habitat but at other times suggesting strain differences of a genic nature. Some species characteristic of the higher altitudes tend to have smooth, thick and rather rigid leaves, as in *D. nudiflora, D. nivicola* and *D. alpicola. D. frigida,* on the other hand, has unusually coarse leaves. *D. purpurascens* tends to have rather broader and flatter blades than allied species such as *D. caespitosa* and *D. eriantha.* The blades are generally attenuate in the genus, but in *D. duttoniana* they narrow rather abruptly near the keeled tip somewhat in the manner of some European species of *Poa. D. longifolia,* when well developed, has leaves more or less flexuose.

The degree of hairiness of the blades and sheaths may be useful at times, but little definite reliance can be placed on this character. While species such as *D. carphoides* and *D. auriculata* are most commonly very pilose and others such as *D. nudiflora* and *D. nivicola* are glabrous, the majority of species show a very great degree of variation in hairiness. *D. eriantha* is typically hairy, the hairs of the uppermost sheaths being especially conspicuous, but specimens have been seen in which this character is absent or inconspicuous. Much confusion has been caused in the past by over-emphasis of this quality, resulting for instance in a large proportion of hairy specimens of diverse relationships being referred to *D. pilosa* purely by virtue of this character. Very hairy and relatively glabrous specimens of the same species may be found growing even in close proximity. Often, however, a marked difference in hairiness may in the field considerably assist in rapid discrimination between species of otherwise similar aspect, as has been observed for instance in some localities among mixed populations of *D. eriantha* and *D. caespitosa*, or of *D. auriculata* and *D. caespitosa*. However, both subglabrous and very pilose forms of *D. caespitosa* may occur.

PANICLE. The size and shape of the panicle, its density, few- or many-flowered condition, and degree of expansion provide useful characters when specimens of well developed plants at similar stages of maturity can be compared. When the inflorescence is developed by plants under relatively harsh conditions, it may be considerably reduced and fail to show the normal characteristics. Thus the short clustered paniculate inflorescence of *D. pilosa* may be reduced to a few spikelets arranged racemosely, and in this condition be scarcely distinguishable from similarly reduced short inflorescences of *D. racemosa* or *D. penicillata*, which, when fully developed, are linear and entirely or sub-racemose and readily distinguishable.

The inflorescence may be short, contracted and more or less ovate as in *D. carphoides* and *D. geniculata*, rather more spreading but still more or less ovate as in *D. auriculata* and *D. eriantha*, longer and loosely spreading as in *D. pallida* and *D. vickeryi*, elongated as in *D. induta*, or racemose to sub-racemose as in *D. racemosa* and *D. penicillata*. A variation from more or less ovate to linear occurs in *D. caespitosa*.

The shape of the panicle changes considerably with degree of maturity, so comparison must be made at anthesis or in the early fruiting stage.

The pedicels of the spikelets and branches of the panicle are commonly scabrous or scabrous-pubescent, but in some species are typically somewhat pilose. Although a quite useful supplementary character, this cannot be depended upon absolutely in the absence of supporting characters.

SPIKELETS. Spikelet size is a useful diagnostic character when comparing species at the extremes of the range. For instance species such as *D. induta*, *D. clelandii*, *D. procera* and *D. bipartita* are characterised by rather large spikelets, while others such as *D. rodwayi*, *D. paradoxa*, *D. carphoides*, *D. geniculata*, *D. nivicola* and *D. pauciflora* are always small. Amongst many other species a considerable range of spikelet size may be apparent, notably in *D. caespitosa*.

The number of florets in the spikelet is rather variable in many species, but is of some diagnostic value in that a few species seldom exceed 3-4-florets as in *D. rodwayi*, *D. paradoxa*, *D. vickeryi* and *D. nivicola*. In the past over-emphasis has at times been placed on number amongst species which have now been observed to vary readily from four to eight or nine florets.

In most species the florets tend to separate slightly at a fairly early stage of development, so that the cluster is laterally compressed. In *D. racemosa* the cluster usually remains coherent in a more or less cylindrical group until relatively late in development when the florets are about to disarticulate. The looseness of the cluster may therefore be slightly helpful, but full allowance must be made for the state of maturity of the specimen.

A certain plumpness of the spikelet may be noted in some species, such as *D. duttoniana, D. procera, D. carphoides* and *D. richardsonii,* related to such factors as breadth of glumes and lemmas, and arrangement of the florets, while many others are more strongly laterally compressed. In assessing this feature on any specimen allowance must be made for modification due to its stage of development.

The relative length of the spikelet cluster and glumes may be helpful, but with few exceptions is difficult to state in absolute terms, as considerable variation may occur. Thus in *D. racemosa* the spikelet cluster usually exceeds the glumes, at least in a fair proportion of the spikelets, while in the closely related *D. pilosa* and *D. penicillata* the glumes usually exceed the florets. This feature in *D. racemosa* appears to be related to the length of the callus of the florets. In assessing the relative length of the glumes and cluster of florets in the accompanying descriptions, the awns of the florets have not been taken into consideration, and the inclusion of the awns or their degree of exsertion from the glumes has been considered separately.

Cleistogamous spikelets or cleistogenes are known to occur in the leaf axils of some species of the genus *Danthonia,* and have been observed in some American species. I have not observed them in any Australian species.

GLUMES. The length of the glumes largely governs the over-all size of the spikelets, which has been discussed above. In the genus *Danthonia* the glumes are usually described as wide in comparison with other genera. Some variation in width occurs, however, and is of limited diagnostic value. Too much variation exists within many species for this to be expressed other than qualitatively and applying to the population as a whole rather than to every individual of that population. Thus in *D. carphoides, D. auriculata, D. richardsonii, D. duttoniana* and *D. procera* the glumes may be described as relatively broad, while in *D. setacea* and *D. acerosa* they are usually relatively narrow. Other species again such as *D. caespitosa, D. eriantha* and *D. pilosa* display considerable variation in width.

The position of greatest breadth of the glumes may be helpful in rare instances. In the majority of the species the glume is lanceolate, and widest at about one-third of its length from the base. In a few, the glume is rather more elliptical with its greatest breadth about the middle.

The glumes are subequal, or one of them, usually the upper, slightly longer than the other. The slight differences noted are not considered to be of diagnostic significance, and are chiefly intra-specific.

The apex is acute or acuminate in all the Australian species, and seldom helpful in distinguishing between species except as a subsidiary function of the breadth or narrowness of the glumes.

The glumes are divergent at anthesis and subsequently, and the degree of divergence is largely a function of maturity. In *D. racemosa* the glumes are often rather less strongly divergent than in most other species.

A central firm portion of the glume may be differentiated from the more membranous and semi-translucent marginal region. This feature is more evident in some species than in others and may be of minor utility.

The glumes are commonly light green in colour when young, fading to a pale straw colour. In many species they may be variously streaked with a purplish coloration which is more characteristic of some species than others. The presence and amount of such coloration, however, is very variable amongst individuals, and is of accessory and not fundamental value. While in some cases its presence suggests a genetic basis, in others it suggests a relationship to climatic and habitat factors. Thus in *D. pilosa,* in which the glumes are usually greenish, a few specimens from the New England district have been seen in which a very strong coloration is developed. In such species as *D. auriculata, D. eriantha, D. vickeryi* and *D. purpurascens* the purplish streaks are most commonly present. In *D. richardsonii* they are rare. *D. paradoxa* is usually purplish. The coloration generally disappears at maturity.

The glumes are normally glabrous, but a few specimens have been seen in which the glumes bear a few loose hairs. This does not appear to have any diagnostic significance.

LEMMA. Within the spikelets the lemmas of the cluster diminish in size and relative proportions of the parts from below upwards. For instance in a cluster of eight the change may be small amongst the lower two or three lemmas but the upper three or four are very markedly and increasingly reduced. In descriptions of the size and proportions of the florets throughout this paper, therefore, only the lowest two or three florets have been taken into consideration, and measurements given must not be taken to apply to the upper florets. It is not considered that detailed analysis of the upper florets would yield further results of taxonomic importance. Their decrease in size, however, suggests a fluidity of potential structure which may be reflected as a phenotypic response to environment. Many specimens grown under harsh conditions or affected by grazing produce spikelets which suggest that the lower florets have not reached the peak of development possible for the species, and have taken on rather the form of lemmas normally found occurring nearer the centre of a well-developed spikelet. Thus in species such as *D. setacea* and *D. caespitosa,* which normally have a marked size difference between their respective lemmas, some specimens of the latter have such small lemmas that discrimination between them becomes a matter of some difficulty. This suggestion is offered as a possible explanation of certain types of variability commonly found in the genus, but it would be desirable if the theory could be tested experimentally by field workers. As discussed earlier the number of florets in the spikelet may also vary considerably, and it is suggested that this also may be in part a phenotypic response.

In spite of considerable variation, the characters of the lemma are regarded as providing the most valuable diagnostic characters of the species and groups of species within the genus.

The lemma consists of a basal callus, a lower portion which has been termed throughout the descriptions of the species the "body of the lemma", two lateral lobes and a terminal awn arising in the sinus between the lobes.

The callus normally bears a rather dense tuft of hairs near the base, and, in most species, widens more or less imperceptibly into the lemma proper. The callus of the lowest lemma is often noticeably shorter than those of the upper florets. In comparing the length of the callus therefore, this should be assessed on the second or third rather than on the first lemma. The length of the callus is in any event rather variable and seldom of diagnostic utility, but may occasionally be helpful, e.g., in *D. racemosa* it appears to be characteristically longer and more slender than in the closely allied species *D. pilosa* and *D. penicillata,* and accounts for the usual projection of the cluster of florets from the glumes.

The body of the lemma has been measured so as to include the callus and up to the sinus. Its length is a helpful feature in discriminating between species at the extremes of the range, but considerable variation in absolute length must be expected especially in the intermediate ranges. It is at least a more reliable character than the total length of the lemma including the awns. Breadth of the lemma is also significant in general terms, but allowance must be made for intra-specific variation. Thus *D. carphoides* and *D. auriculata* typically have broad lemmas, those of *D. setacea* are extremely slender; *D. caespitosa* is typically moderate in width but varies considerably, and *D. eriantha* may be as broad as *D. auriculata* or as slender as typical forms of *D. caespitosa.*

The body of the lemma is typically pale thoughout, or greenish when young, but in *D. duttoniana* it normally turns a light golden brown at maturity, though less mature specimens are as pale as in allied species.

The lateral lobes are flat in the lower portion and may simply be acute or acuminate, but more commonly terminate in short or rather long awns which have been designated as setae. In the flattened portion a more membranous and lighter coloured outer band can often be distinguished from the firmer region adjacent to the central awn. This membranous margin, as it is here termed, usually narrows evenly and may be recognisable up to its termination at the base of the seta. In *D. auriculata*, however, it becomes abruptly truncated a short distance above its base, forming a distinct auricle which is a convenient aid in the recognition of this species and in discriminating between it and *D. eriantha.* In some species the membranous margin is scarcely clearly differentiated.

The absolute length of the setae and their relative length to the flat parts of the lateral lobes is of significance, as is the relative length of the lateral lobes and the body of the lemma.

The terminal awn also provides a few points of diagnostic value. It may be short (minute in *D. rodwayi*) and not or scarcely exceeding the lateral lobes, or variously longer and often much exceeding them. Though slender, it is flat at the base and attenuate towards the tip. The lower portion may be simply reflexed at maturity, or once or twice loosely twisted and then reflexed, or strongly twisted for several millimetres and geniculate above the coils. The twisted portion is dark-coloured and shining in many species. While the absolute length of the awn may be variable, the general proportions of the body, lateral lobes and central awn are fairly characteristic of the species. The degree of exsertion of the awns from the glumes may also be helpful.

HAIRS OF THE LEMMA. The position and arrangement of the hairs on the lemma provide some of the most valuable characters, though even these characters may at times prove inconveniently inconstant.

As previously indicated the callus usually bears a tuft of hairs, and these must not be confused with those located on the body of the lemma. In some species the lemma is uniformly pilose below the sinus, the hairs being all approximately similar in length, as in *D. paradoxa, D. pallida* and their allies. In others the lower part of the lemma in pilose all over the back, but the uppermost hairs are longer and arranged in a transverse row below the sinus. These upper hairs are sharply differentiated in length from those below in *D. semiannularis* and *D. longifolia,* while in *D. richardsonii* and *D. linkii* the transition between them is gradual. Again, other species have the hairs arranged in two distinct rows of tufts, the lower series close to or some distance above the callus, the upper series a little below the sinus, and the intermediate area glabrous, as in *D. auriculata, D. eriantha, D. duttoniana* and *D.*

caespitosa. A few species display transitional stages in that, although the hairs are chiefly differentiated into two series, a few scattered hairs occur on the intermediate zone. In fact almost any species that is typically glabrous on the back may occasionally show the development of a few sparse scattered hairs. A further modification is marked by the suppression of certain or all of the tufts of hairs. In *D. laevis* this suppression relates only to the lower series which are reduced to marginal tufts, the lower part of the back being otherwise glabrous above the hair-tufts of the callus, but the upper series is well developed. In *D. pilosa* and its allies the upper series also are normally reduced to two lateral and two dorsal tufts, or the dorsal tufts may be missing, while in *D. nudiflora* and *D. nivicola* all may be completely or partially suppressed.

Viewed broadly these characters of the hair arrangement appear to offer a satisfactory evolutionary series, but the degree of evolution of the species appears to be incomplete or unstable, or, alternatively, confused by natural hybridization, since in most species individuals occur which deviate from the norm for that species. In observing the position of origin of the hairs, specimens at or after anthesis are desirable, as at earlier stages their exact location is difficult to discern with accuracy, and at all times care must be taken in examination that the tips of the lower hairs do not obscure the position of those above them.

PALEA. The palea varies from obovate or obovate-spathulate to oblong, elliptical, lanceolate or narrow-lanceolate, and may barely attain to or much exceed the sinus of the lemma. Although some variation occurs, the shape of the palea is generally characteristic in each species, and constitutes a useful diagnostic character. For example the shape of the palea forms the most useful distinction between *D. richardsonii* and *D. linkii,* which have many other characters in common, and whose other differences are better expressed as tendencies than as measureable quantities.

The apex of the palea is truncate or minutely bilobed. The bilobed character has at times been accorded undue emphasis in specific diagnosis, but in my experience this feature shows considerable intra-specific variation, and is of little specific signficance.

The texture of the palea is usually thin and more or less membranous as in *D. pallida* and *D. linkii,* but may be moderately firm, especially at the base.

The palea is strongly keeled towards each margin, the true edges being folded back against the inner surface, and inconspicuous. This marginal region is very thin and at times bears rather long scattered hairs in the lower part. The back of the palea is also sometimes loosely pilose. The keels are usually minutely ciliolate in the upper part.

LODICULES. The lodicules have not received any particular attention in this study, as it is not felt that they provide characters of any specific diagnostic value.

STAMENS. There are three stamens present in all cases observed. Size of the anthers appears to be related chiefly to the size of the lemma which is more conveniently observed. Their colour is of some minor interest, being generally yellowish, but in a few species such as *D. pallida, D. clelandii* and *D. purpurascens,* salmon- or orange-red. The colour changes somewhat with maturity, and anthers of a deep colour may fade with age. In the field, however, this character may be quite useful at anthesis.

CARYOPSIS. The caryopsis is usually light brown at maturity and ovoid or oblong. It varies chiefly in size, related to the size of the florets. It remains enclosed between the lemma and palea at disarticulation, but is free from them.

Abbreviations.

In citation of the specimens, the location of each is indicated by the following abbreviations: (AD.) Herbarium of the Department of Botany, Adelaide University; (ADW.) Herbarium of the Waite Agricultural Research Institute, Adelaide; (BM.) British Museum of Natural History; (BRI.) Botanical Museum and Herbarium, Brisbane; (CAN.) Herbarium of the Commonwealth Scientific and Industrial Research Organization, Canberra; (CGE.) Botanical Museum and Herbarium of the School of Botany, Cambridge University; (HO.) Herbarium of the School of Botany, Hobart University; (K.) Herbarium of the Royal Botanic Gardens, Kew; (MEL.) National Herbarium, Melbourne; (NSW.) National Herbarium of New South Wales, Sydney; (SYD.) Herbarium of the School of Botany, University of Sydney; (ENM.) Herbarium of the late Rev. E. N. McKie of Guyra, N.S.W. Unfortunately the greater part of the Rev. McKie's herbarium was destroyed shortly after his death. Where duplicates exist in the National Herbarium of N.S.W. or elsewhere, references to his herbarium have therefore been omitted. In some other cases specimens which were seen in his own herbarium constitute locality records which are vouched for by the present writer, and have therefore been included in the citation; (FAR.) Herbarium of Dr. F. A. Rodway, Nowra, N.S.W.; (JBC.) Herbarium of Professor J. B. Cleland, Adelaide; (JMB.) Herbarium of the late Mr. J. M. Black, Adelaide; (RAB.) Herbarium of Mr. R. A. Black, Mont Albert, Victoria.

Acknowledgments.

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Generic Description.

Danthonia DC. in Lamarck et De Candolle, Flore Française, ed. 3, III (1805), 32.

Caespitose perennials, low or moderately tall with flat or convolute leaves. Inflorescence terminal, rather few-flowered, paniculate or occasionally more or less racemose, the spikelets often rather large and more or less erect. Spikelets 3- to several-flowered, the rhachillae readily disarticulating above the glumes and between the florets. Glumes about equal, fairly broad, papery, acute, keeled above, distinctly or obscurely 5- to 7-nerved or the nerves not apparent, persistent, usually exceeding the florets except for the exserted awns. Florets hermaphrodite, rounded on the back, diminishing in size from below upwards, the uppermost often reduced. Lemma 2-fid, the lobes acute, acuminate or terminating in fine setae, awned between the lobes, on the back variously smooth or pilose or bearing tufts of hairs either isolated or in transverse rows, the terminal awn short or long, but usually exceeding and stronger than the setae and then reflexed or geniculate and more or less flat and often twisted at the base. Palea hyaline or rather firmer, keeled and infolded near the margins, obtuse, truncate or 2-dentate. Stamens 3. Caryopsis free from the lemma and palea but remaining included, usually ovoid or oblong.

KEY TO THE AUSTRALIAN SPECIES OF DANTHONIA.

1. Lower sheaths very woolly around the more or less swollen base of the plant. Leaves usually flat. Central awn usually shorter than the lateral lobes. Body of the lemma sub-globular to broadly turbinate, 2-3 mm. long, with a dense row of hairs below the sinus and at the callus and often with a few scattered hairs between the rows, otherwise smooth or minutely roughened. Lateral lobes about three times as long as the body, linear-oblong, unawned .... *D. bipartita* 1.

1*. Lower sheaths not woolly nor the base of the plant noticeably swollen.

 2. Body of the lemma with abundant hairs scattered over the back.

  3. Hairs on the lemma more or less uniform in length, the lemma without a row of conspicuously longer hairs below the sinus (sometimes the upper hairs slightly longer in *D. geniculata* and *D. clelandii*, especially those of the lateral tufts in the latter).

   4. Central awn not more than 2 mm. long, shorter than to scarcely exceeding the lateral lobes, or reduced to a minute muero or absent. Whole lemma 3-5 mm. long, oblong. Lateral lobes broad and obtuse or shortly acute, shorter than the body of the lemma. Palea oblong. Glumes lanceolate. Panicles loose.

    5. Central awn absent or reduced to a very minute delicate mucro. Spikelets 5-7 mm. long, 2-3-flowered .... *D. rodwayi* 2.

    5*. Central awn distinct, usually about 1 mm. long, flattened, reflexed. Spikelets mostly 5-9 mm. long, 3-5-flowered ... . *D. paradoxa* 3.

   4*. Central awn more than 2 mm. long, reflexed or twisted at the base.

    6. Central awn much exceeding the lateral lobes. Lateral lobes half to one and a half times as long as the body of the lemma, or if twice as long then the body of the lemma more than 3 mm. long. Palea linear, oblong, lanceolate or oblanceolate, much exceeding the sinus. Anthers orange-red, orange-yellow or brownish.

     7. Spikelets 6-9 mm. long, mostly 3-flowered. Body of the lemma 3.5-4 mm. long. Lateral lobes about 2 mm. long, broad, obtuse to acute, not or very minutely awned. Culms 30-60 cm. Blades inrolled-setaceous, often somewhat flexuose. Panicle 5-15 (mostly 6-8) cm. long, ovate to broadly pyramidal, the branches almost filiform. .... *D. vickeryi* 4.

     7*. Spikelets 8-20 mm. long. Body of the lemma 4-7 mm. long. Lateral lobes acute, acuminate or truncate, short- or moderately long-awned (sometimes unawned in *D. pallida*), 3-8 mm. long, usually longer than the body. Plants 50-120 cm. high. Panicles (at least when dry) more or less lanceolate.

      8. Sheaths of the basal leaves not conspicuously broad and flattened. Culms tall, usually much exceeding the basal leaves. Palea pilose or pubescent on the back in the lower part. Glumes exceeding the florets. Central awn at length twisted for several mm. at the base. Panicle-branches smooth, scabrous or scabrous-pubescent, without tufts of hairs at the axils. Anthers usually orange-red.

9. Lateral lobes of the lemma more or less hyaline throughout, unawned or narrowed into minute fine setae, sometimes rather truncate. Hairs of the lemma all uniform in length. Palea membranous, subequal in length to the lateral lobes, pilose on the back in the lower part with hairs like those of the lemma. Glumes 8-22 (generally about 13) mm. long. Florets 2-4 (rarely up to 6) .. .. *D. pallida* 5.

9*. Lateral lobes firm with membranous margins, gradually narrowed into distinct setae. Hairs of the lemma slightly longer at the base and at the upper lateral tufts, rarely the dorsal hairs rather sparse. Palea much shorter than the lobes, pubescent on the back in the lower part with hairs much shorter than those of the lemma. Glumes 16-20 mm. long .... *D. clelandii* 6.

8*. Sheaths of the basal leaves conspicuously flattened and about 1 cm. wide, persistent around the base of the plant. Subalpine plant with culms 60-90 cm. high, generally not much exceeding the basal leaves. Palea glabrous on the back between the keels, very firm, strongly thickened on the keels. Central awn coarse, geniculate but not or only very slightly twisted in the lower part. Florets 4-8, generally exceeding the glumes. Panicle contracted, lanceolate, the panicle-branches pilose and often with a tuft of longer hairs at the axils. Lemma firm, the lateral lobes with membranous margins. Anthers usually orange-yellow. .... *D. frigida* 7.

6*. Central awn not or scarcely exceeding the acuminate or very shortly awned lateral lobes. Body of the lemma about 2.5 mm. long, the lobes twice as long. Palea obovate-oblong. Spikelets 5-8 mm. long. Upper hairs of the lemma sometimes a little longer than the lower. Anthers pale. Short tufted perennial with almost filiform leaves. .... *D. geniculata* 9.

3* Upper row of hairs on the lemma distinctly longer than the lower scattered dorsal hairs. Anthers usually pale (except in *D. induta*).

10. Lateral lobes shorter than the body of the lemma, broad, obtuse or acute, not or minutely awned. Plants usually small, 10-40 cm. high, the panicle short, ovate, with rather few spikelets.

11. Glumes broad. Lemma broad, the body obliquely turbinate. Palea broadly obovate .... *D. carphoides* 8.

11*. Glumes, lemma and palea narrower .... *D. carphoides* var. *angustior* 8a.

10\.* Lateral lobes equal to or longer than the body of the lemma.

12. Lateral lobes usually two to three times as long as the 2-3 mm. body of the lemma. Central awn more or less twisted at the base, about equal to the lateral lobes or usually not exceeding them by more than 2 mm., not or scarcely exceeding the glumes. Plants not large, up to 45 cm. high. Panicle lanceolate to ovate, contracted, with 5-15 spikelets. Palea obovate-spathulate or obovate-oblong, very obtuse.

13. Leaves more or less filiform. Hairs on the back of the lemma always scattered though often densest in a row below the sinus, those on the back not conspicuously shorter than those of the upper row. Lateral lobes narrowing very evenly into the 1-2 mm. setae and scarcely well differentiated from them. Glumes 5-8 mm. long, widest near the middle .... *D. geniculata* 9.

13.* Leaves rather fine but not filiform. Hairs on the lemma typically in 2 more or less distinct rows and when dorsal scattered hairs are present they are shorter than those of the upper row. Lateral lobes usually narrowed more acutely into the 2-4 mm. setae and more clearly differentiated from them. Glumes 8-11 mm. long, more acuminate, widest in the lower third .... *D. monticola* 10.

12.* Either the lateral lobes not twice as long as the body of the lemma, or the body 3 mm. long or over, or the central awn not much twisted at the base or if so then exceeding the lateral lobes by more than 2 mm. or distinctly exceeding the glumes.

14. Shorter dorsal hairs usually over 1 mm. long and grading upwards into the uppermost band of longer hairs. Body of the lemma 3 mm. long or more.

15. Central awn reflexed or about once loosely twisted at the base. Plants leafy, mostly 30-90 cm. high.

16. Palea broadly obovate, obtuse, usually very shortly exceeding the sinus. Glumes and lemmas rather broad. Lateral lobes rather broad at the base, scarcely or very shortly awned, less than twice as long as the body of the lemma. Central awn equal to the lateral lobes or very shortly exceeding them .... *D. richardsonii* 11.

16.* Palea lanceolate-elliptical, acute, distinctly exceeding the sinus. Glumes and lemmas usually a little narrower. Lateral lobes often twice as along as the body of the lemma, narrower, attenuate into the usually distinct fine setae or occasionally scarcely awned. Central awn equal to the lateral lobes or exceeding them by up to 5 mm. .... *D. linkii* 12.

15.* Central awn strongly twisted at the base. Palea lanceolate or narrow-lanceolate.

17. Central awn equal to the lateral lobes or exceeding them by up to 5 mm. Body of the lemma 3-4 mm. long. Palea under 5 mm. long, lanceolate-elliptical, shortly though distinctly exceeding the sinus. Spikelets usually 5-6-flowered. Panicle 5-15 cm. long. Plants mostly 50-70 (rarely to 100) cm. high. Anthers pale .... *D. linkii* var. *fulva* 12a

17.* Central awn exceeding the lateral lobes by 6-9 mm. Body of the lemma 4-5.5 mm. long. Palea very narrow-lanceolate, 6-8 mm. long, much exceeding the sinus and sometimes almost twice as long as the body of the lemma. Spikelets loosely 3-5-flowered. Plants 70-120 cm. high, robust.

18. Lemma slender, the lateral lobes usually gradually narrowed into the setae, the dorsal hairs fairly abundant. Glumes rather narrow. Palea more or less membranous. Anthers orange-yellow. Panicle 15-25 cm. long. Chiefly in northern districts of N.S.W. .... *D. induta* 13.

18.* Lemma rather stout, the lateral lobes narrowing more abruptly into the setae, the dorsal hairs scanty. Glumes rather broad. Palea firm. Anthers yellow. Panicle 8-15 cm. long. Chiefly Tasmanian .... *D. procera* 24.

14.* The hairs scattered on the back of the lemma uniformly short, mostly about 0.5 mm. long or less (or rather more in *D. alpicola*), much shorter than those of the upper row.

19. Body of the lemma 3 mm. long or over.

20. Lemma linear, rarely linear-lanceolate, very slender, the narrow lateral lobes attenuate into rather long setae. Callus about 1-1.5 mm. long, sharp-pointed. Glumes very narrow, acuminately narrowed into points. Hairs on the back of the lemma abundant, more or less uniformly scattered. Leaves rather fine, subglabrous to densely hirsute, inrolled. Western Australian species .... *D. occidentalis* 14.

20.* Lemma lanceolate, the lateral lobes moderately broad, narrowing into setae about as long as the flat portion. Hairs on the back of the lemma sparse, mostly concentrated in two rows. Callus blunt. Glumes rather broad. Leaves thick, rigid, folded, smooth. At high elevations in eastern Australia. .... *D. alpicola* 21.

19.* Body of the lemma less than 3 mm. long, rarely longer in some forms of *D. setacea*.

21. Lateral lobes unawned or shortly awned (setae not exceeding 4 mm.). Lemma more or less uniformly pubescent below the upper row of hairs.

22. Lateral lobes not or minutely awned, not or scarcely exceeding the upper row of hairs. Culms about 3-noded, the leaves not flexuose.

23. Sheaths subglabrous. Ligule of short (0.5 mm.) hairs. Blades involute, firm .... *D. semiannularis* 15.

23.* Sheaths conspicuously pilose with spreading hairs about 3 mm. long. Ligule with long tufts of hairs at each side Leaves flat at the base, soft .... *D. semiannularis* var. *gracilis* 15a.

22.* Setae of the lateral lobes exceeding the upper row of hairs by 2-4 mm. Culms usually 5-many-noded, the leaves long (up to 35 cm.) and somewhat flexuose, becoming inrolled-filiform .... *D. longifolia* 16.

21.* Lateral lobes with 4-6 mm. long capillary setae usually equalling or exceeding the glumes. Lemma with only sparse scattered hairs on the back (more often the hairs in two distinct rows). .... *D. setacea* 12.

2.* Lemma with hairs in distinct tufts or transverse rows of tufts and otherwise smooth (rarely with a few irregularly scattered hairs on the back), or the tufts of hairs reduced or absent.

24. Lemma with a complete transverse row of hair-tufts just below the sinus (rarely with occasional tufts suppressed).

25. Lemma with a row of hair-tufts just above the callus, these often rather sparse and irregular in *D. pauciflora*.

26. Membranous margins continued up the outer edges of the lateral lobes, not auriculate.

27. Body of the lemma usually pale at maturity, or somewhat grey in *D. procera*.

28. Body of the lemma 1.25-3 mm. long, rarely slightly longer in some forms of *D. setacea*.

29. Lateral lobes (including setae) less than 6 mm. long.

30. Body of the lemma, 2.5-3 mm. long, the lemma rather broadly oblong, firm, the lobes broad and narrowing rather abruptly into the acute apices or short setae which are shorter than or scarcely exceed the strongly twisted lower portion of the central awn .... *D. dimidiata* 32.

30*. Body of the lemma less than 2.5 mm. long.

31. Lateral lobes about 1-2 mm. long, not or minutely awned. Body of the lemma short and broad, 1.25-1.5 mm. long. Palea oblong, obtuse. Panicle very small, few-flowered. Florets 3-5. Plant very short. Subalpine situations in Tasmania. *D. pauciflora* 17.

31.* Lateral lobes 3-4 mm. long, the central awn only very shortly exceeding the glumes or included. Palea oblanceolate to lanceolate. Lemma very slender *D. setacea* var. *breviseta* 19a.

29.* Lateral lobes (including setae) 6-10 mm. long.

32. Lateral lobes with short (2-4 mm.) setae. Palea obovate-spathulate or obovate-oblong. Central awn only shortly exceeding the lateral lobes, not or scarcely exceeding the glumes. Body of the lemma rather broad .... *D. monticola* 19

32.* Lateral lobes with 4-6 mm. capillary setae. Central awn exceeding the setae by 3-6 mm., and exceeding the glumes. Palea oblanceolate to lanceolate. Lemma slender .... *D. setacea* 19.

28.* Body of the lemma 3 mm. or over.

33. Setae much shorter than the flat portion of the lateral lobes and usually about 2 mm. (rarely up to 4 mm.) long.

34. Lemma lanceolate, the body about 3.5 mm. long. Palea oblanceolate or broadly elliptical, shortly but distinctly exceeding the sinus. Anthers orange-yellow. Plants 30 to (rarely) 90 cm. high .... *D. purpurascens* 18.

34.* Lemma narrow-elliptical, the body 4-5 mm. long. Palea narrow-elliptical, 7-8 mm. long and greatly exceeding the sinus. Plants 70-120 cm. high .... *D. procera* 24.

33.* Setae about as long as the flat portion of the lateral lobes and rarely less than 4 mm. long (occasionally shorter in some forms of *D. eriantha*).

35. Lemma linear, very slender. Palea narrow-oblong to linear. Panicle branches scabrous-pubescent to pilose. Western Australian species .... *D. acerosa* 20.

35.* Lemma linear-lanceolate to broadly lanceolate.

36. Palea narrow-lanceolate, often drawn out into a narrow membranous tip, usually much exceeding the sinus. Panicle branches smooth, scabrous, or minutely pubescent, very rarely pilose. Lemmas

mostly glabrous between the rows of hairs, rarely with a few sparsely scattered hairs in some forms.

37. Leaves short, thick, rigid. Panicles ovate to ovate-lanceolate, very contracted, dense. Usually at high elevations in south-eastern Australia .... *D. alpicola* 21.

37.* Leaves usually neither rigid nor thick, but very variable, usually rather long and either flat or inrolled. Panicles mostly linear-lanceolate to lanceolate, rarely ovate, less closely contracted. Very widespread species .... *D. caespitosa* 22.

36.* Palea broadly obovate to oblanceolate, only shortly exceeding the sinus. Panicle branches usually somewhat pilose or at least pubescent. Glumes often somewhat broad below the middle ...... *D. eriantha* 25.

27.* Body of the lemma golden-brown at maturity, rather broad, the lobes pale. Lateral lobes rather broad and shortly narrowed into setae up to about as long as the flat portion, occasionally longer. Central awn exceeding the setae by 5-6 mm. Body of the lemma 3-4 mm. long. Palea ovate-lanceolate. Glumes rather broad. Panicle broadly pyramidal to ovate, the lower branches rather long and bare at the base .... *D. duttoniana* 23.

26.* Membranous margins of the lateral lobes ending abruptly in a small triangular auricle and not continued up to the setae, the auricles rarely somewhat reduced. Palea oblong to broadly oblanceolate. Body of the lemma broad. Glumes broad in the lower third. Central awn usually only shortly exceeding the setae. Panicle short, ovate, few-flowered .... *D. auriculata* 26.

25.* Lemma without a transverse row of hairs just above the hairy callus, though often with lateral tufts at the margins. Palea lanceolate, oblanceolate to almost obvate .... *D. laevis* 27.

24.* Lemma with dorsal and marginal tufts of hairs below the sinus, not or rarely forming a somewhat interrupted row across the back, or the tufts of hairs wholly or partly suppressed.

38. Lateral lobes longer than the body of the lemma, long- or short-awned. Body of the lemma 3 mm. long or more. Central awn much exceeding the lateral lobes. Panicle usually more than 3 cm. long.

39. At least the lower and often also the upper dorsal tufts of hairs present. Leaves not rigid, often pilose. Body of the lemma 4-6 mm. long.

40. Panicle usually short, about 4-5 cm., contracted, rather crowded, more or less lanceolate, erect. Glumes straight, slightly longer than the group of florets. Lateral lobes tapering evenly into the setae, about twice as long as the body of the lemma.

41. Central awn exceeding the setae by about 5 mm. .... *D. pilosa* 28.

41.* Central awn exceeding the setae by up to 10 mm. Glumes and florets rather larger and coarser than in the preceding .... *D. pilosa* var. *paleacea* 28a

40.* Panicle linear, 5-15 cm. long, often sub-racemose, usually not crowded.

42. Rhachis slender, usually somewhat drooping. Glumes exceeding the florets, slightly cymbiform. Spikelets mostly 4-6-flowered. Lateral lobes about twice as long as the body of the lemma, tapering evenly into the setae .... *D. penicillata* 29.

42.* Rhachis slender but held erect. Florets exceeding the straight glumes. Spikelets mostly 7-10-flowered. Lateral lobes narrowing more acutely or sometimes obtusely into the setae.

43. Lateral lobes narrowing acutely or obtusely into setae ...... *D. racemosa* 30.

43.* Lateral lobes very obtuse or obtusely truncate, without setae or with excentric very short points .... *D. racemosa* var. *obtusata* 30a.

39.* Upper and lower dorsal tufts of hairs usually absent, the lateral tufts present. Leaves rigid, more or less setaceous, glabrous, smooth. Small perennial found at high elevations of the Australian Alps ...... *D. nudiflora* 31.

38.* Lateral lobes (including setae if present) shorter than to very slightly longer than the body of the lemma.

44. Lateral lobes shorter than the body of the lemma, acute or shortly acuminate, not or scarcely awned, the whole lemma 3-4 mm. long, the central awn shortly exceeding the lobes. Spikelets up to 8 mm. long, about 4-flowered. Panicle 2-3 cm. long. Small perennial with fine, smooth, rather rigid, setaceous leaves, found at high elevations of the Australian Alps and in Tasmania .... *D. nivicola* 32.

44.* Lateral lobes 2-4 mm. long, shorter than to slightly longer than the body of the lemma, narrowing within about 1 mm. into the short setae. Body of the lemma 2.5-3 mm., the central awn much exceeding the setae. Spikelets 5-10 mm. long, mostly 4-5-flowered. Panicle 3-6 cm. long. Leaves fine, soft. Tasmanian species .... *D. dimidiata* 33.

ENUMERATION OF SPECIES.

1. D. bipartita F. Muell., Fragm. Phyt. Austral., I (1859), 160; Ibid., VIII (1873), 136. Figured in Agric. Gaz. N.S.W., II (1891), 23; Ibid., XXXI (1920), 26.

HOLOTYPE: *New South Wales:* Darling River, Dallachy (MEL.; duplicate K.).

SYNONYM: *Monachather paradoxus* Steud., Syn. Pl. Glum., I (1854), 247. (Non *Danthonia paradoxa* R. Br., 1810). I have examined a specimen of the same number as the Holotype of *M. paradoxus*, viz. Drummond coll. IV, No. 396, in the herbarium of Cambridge University. The epithet "paradoxus", though earlier than "bipartita", is not available for use in the genus *Danthonia.*

Caespitose perennial, erect, or sometimes geniculate at the lower nodes, the somewhat swollen, bulbous base covered with scale-like sheaths bearing dense woolly hairs. Culms 2-3-noded, moderately slender, microscaberulous. Nodes glabrous. Sheaths pilose with rather long white hairs, or sometimes almost glabrous, often microscaberulous between the nerves, usually shorter than the internodes, occasionally light-purplish. Ligule membranous, truncate, jagged, 1-3 mm. long, often bordered with rather dense cilia. Blades mostly 7-12 cm. long, 1-3 (rarely 4) mm. wide, more or less flat, not or slightly rigid, gradually attenuate at the apex, striate, grooved, more or less seabrous on the upper surface, microscaberulous between the nerves below, sprinkled with long white hairs or sometimes almost glabrous, the margins sometimes scabrous. Panicle 5-15 cm. long, usually exserted, linear, almost racemose with few spikelets, or the lower branches scantily divided especially in robust specimens, rarely the branches spreading, the rhachis and pedicels finely scabrous. Spikelets few on short, erect, distant pedicels, green, 8-17 (usually 11-14) mm. long, 3-8- (mostly 5-6-) flowered, the florets crowded, usually not or scarcely exceeding the glumes. Glumes subequal or the lower glume slightly longer than the upper, rather broad, acute, striate, about 13-nerved, scaberulous on the nerves, and with narrow membranous margins. Lemma deeply bifid, the body obliquely turbinate, hard, scarcely 2 mm. long including the very short callus, and almost as broad, densely hairy, the hairs mostly but not exclusively towards the base and in a row below the sinus, the upper series of hairs nearly 5 mm. long, the lemma smooth and shining between the hairs, pale at first, becoming brownish-black at maturity, the hairs also becoming dark; lateral lobes much longer than the body of the lemma, about 6-7 mm. long, linear-oblong, acute or sometimes obtuse, awnless, about 4-nerved, the nerves rather conspicuous, the membranous margins narrow and inconspicuous, microscaberulous; central awn shorter than or rarely scarcely exceeding the lateral lobes, fine, slightly twisted at the base. Palea very shortly exceeding the body of the lemma, broadly ovate, rather abruptly narrowed above the middle, truncate or obtuse, considerably thickened and minutely ciliate on the keels, glabrous on the back, forming a distinct oblique covering over the top of the grain. Anthers very small, about 0.3 mm. long, the florets probably cleistogamous. Fruit ovate-orbicular in outline, the embryo almost as long as the fruit, somewhat flattened, broadly but shallowly grooved on one side. Fig. 1.

LOCALITIES: *Australia:* Schomberg (AD.).

Queensland: Noondoo, near Dirranbandi, on stony ridge in *Eucalyptus melanophloia* parkland, S. T. Blake No. 10612, 29.2.1936 (BRI.; NSW. 1265); Morven, on timbered barren rocky sandy hill-top, 1,400 feet, S. T. Blake No. 10924, 31.3.1936 (BRI.; NSW. 1266); Adavale, W. MacGillivray, 28.8.1923 (BRI.; ADW.; K.); Mt. Howitt Station, 80 miles west of Eromanga, on drifted sand with *Eragrostis eriopoda, Eriachne* and other grasses, S. T. Blake No. 11942, 4.7.1936 (BRI.; NSW. 1264); Charleville, in dense *Acacia aneura* forest on sandy loam, 1,000 feet, S. T. Blake No. 11063, 5.3.1936 (BRI.; NSW. 1263); Maruga, near Charleville, C. Tidswell No. 2, 11.4.1930 (local name "Rock Oats") (BRI.); Yanna Siding, near Charleville, J. D. Hutchinson, 1934 (K.); Oakwood Station, near Charleville, W. White No. 4, 5.1936 (BRI.); Charleville, J. B. O. Evans, 22.7.1904 (K.); Charleville, W. D. Francis, 3.1934 (K.); Roma, J. B. O. Evans, 4.1908 (BRI.; K.); near Roma, J. Cumming (K.); Roma, C. H. Defries, 9.3.1937 (BRI.); 90 miles west of Cooper's

Creek, F. Mueller, 1896 (MEL.); "Gilruth Plains", Cunnamulla, G. H. Allen No. R. 126, 25.2.1941 (RAB.); Cunnamulla, J. B. O. Evans, 11.1905 (BRI.); Murweh, near Charleville, R. A. Cameron, 5.1913 (BRI.); near Miles, R. C. Beasley, (K. 162); Kindon Station, 54 miles NNE of Goondiwindi, L. S. Smith No. 559, 6.12.1938 (BRI.); Dynevor Downs, Warrego district, C. T. White No. 11551, 2.4.1941 (BRI.); "Warrie", on red sandy soil, W. Willoughby, 4.1939 (CAN.).

New South Wales: Western Interior of N.S.W., C. Moore, 1880 (MEL.); Waverly Downs, A. W. Muller, 4.1906 (NSW. 1248; AD.); Warrego River district (AD.); Wanaaring Travelling Stock Route (Bourke district), per Glenfield Veterinary Research Station, 18.9.1939 (NSW. 1239); Tibooburra, E. F. Constable, 25.10.1949 (NSW. 10376); Toorale-Goonery, J. L. Boorman, 10.1912 (NSW. 1240); Brindingabba-Arrara, J. L. Boorman, 10.1912 (NSW. 1244); Tarcoon, J. L. Boorman, 11.1903 (NSW. 1247); Bourke district, D. W. F. Hatten, 5.1900 (NSW. 1252); Bourke-Byrock, in dry grassland, J. Vickery, 22.12.1934 (NSW. 1236; SYD.); Coolibah district, J. C. Butchee, 7.2.1941 (NSW. 1237); Coolibah, R. Helms, 26.4.1900 (NSW. 1243); Coolibah, comm. J. N. Whittet (K. 17); Byrock, E. Betche, 9.1888 (NSW. 1246); Collarenebri-Walgett on western road, in dry grassland, J. Vickery, 21.12.1934 (NSW. 1235); Clover Creek, J. Mackay No. 55, 9.1890 (MEL.); Nyngan, E. Breakwell, 9.3.1915 (NSW. 1238, 1257); Nyngan, L. G. Little, 1920 (NSW. 1245); Louth, L. Abraham, 9.1912 (NSW. 1249); Boppy Mountain, near Cobar, J. L. Boorman, 7.1903 (NSW. 1251); Cobar, H. Andrae, 1885 (MEL.); Broken Hill district, W. R. Baker, 28.3.1904 (MEL.); Condobolin, McDougall, 5.1913 (NSW. 1250); Wongabilli Station, F. W. Gilbert (ADW.).

? *Victoria:* Mt. Hotham, E. E. Pescott, 1.1899 (cult.?) (ADW.); Grampians, C. Walter, 12.1887 (NSW. 1258).

South Australia: Oakden Hills, 100 miles N of Port Augusta, W. Gill, 2.1904 (NSW. 1269); Oakden Hills, W of Lake Torrens, B. J. Murray No. 381, 1.2.1930 (AD.); Mount Eba, E. Giles, 1880 (MEL.); near Ferdinand River, R. Helms, 7.6.1891 (MEL.); Victoria Desert, Camp 51, on sand, R. Helms, 14.9.1891 (AD.); Yudnapinna Station, H. M. Douglas, 7.10.1939 (ADW.).

Central Australia: R. Tate, 20.7.1894 (NSW. 1268); Upper Arkaringa Valley, R. Helms, 20.5.1891 (NSW. 1262); Tietkins, 1889 (MEL.); 15 miles W. of Liddles Hill, J. B. Cleland, 16.6.1935 (BRI.); Finke, J. B. Cleland No. H. 378 (K.); Centre of South Australia, Mr. Gosse's Expedition, comm. R. Schomburgh, 5.1874 (K.); near the Sentinel, Musgrave Ranges, H. Basedow, Mackay Explor. Exped., No. 51, 1926 (K.).

Western Australia: Drummond, coll IV, No. 396, ex herb. Lehmann (K.); Swan River, Drummond No. 209 (K.); Swan River, Drummond No. 396 (Type Number of *Monochather paradoxus* Steud., CGE.); Mt. Narryer, Murchison River, J. Tyson, 1898 (PERTH); Meekatharra, C. A. Gardner No. 2350, 20.7.1931 (PERTH); Mt. Magnet, W. V. Fitzgerald, 9.1903 (NSW. 1272); Poison Creek, via Leonora, A. A. McGregor, 9.1909 (NSW. 1271); Nannine, W. V. Fitzgerald, 9.1903 (NSW. 1267); Laverton, J. H. Maiden, 9.1909 (NSW. 1261); near Fraser's Range, J. Batt, 1896 (MEL.); Three Springs, F. Stoward No. 216, 10.1912 (NSW. 1274); Pindar, J. H. Maiden, 10.1909 (NSW. 1270); Smithfield, W. V. Fitzgerald, 9.1898 (NSW. 1259; 1260); Lake Violet Station, F. M. Bennett, 7.1941 (PERTH); Latham, H. A. McAlpine, 4.1942 (PERTH); Tenindewar, C. B. Palmer, 1930 (K.; BRI.); Kuninoppin, F. Stoward (K. 204); Yundamindra Run, 120 miles NW. of Kalgoorlie, T. Pearse, 1931 (K.).

The specimens cited by Bentham in the Flora Australiensis under *D. bipartita* are all referable to this species.

D. bipartita is a constituent of arid grasslands, where its drought-resistant qualities give it some slight economic value in natural mixed pastures.

2. D. rodwayi C. E. Hubbard in Hooker's Icones Plantarum, t. 3439 (1943), figured.

HOLOTYPE: *New South Wales:* Near Summit of Mt. Currockbilly, 50 miles SSW of Nowra, alt. 3,600 feet, F. A. Rodway, 2.1.1938 (K. 2661; duplicates FAR. 10178; NSW. 1444).

Erect, densely caespitose, glabrous perennial, about 35 cm. high. Culms slender, smooth, 2-3-noded, the nodes yellowish. Sheaths smooth, loosely imbricate at the base, papery, pale, the upper sometimes a little longer than the internodes and appressed. Ligule reduced to a dense row of very short cilia. Laminae rather slender, setaceous, obtuse, up to 20 cm. long, involute or convolute, up to 2 mm. broad when flattened, somewhat flexuose, at length recurved, closely veined above, scaberulous towards the apex and on the nerves and margins. Panicle lanceolate to ovate, loose, 4-10 cm. long, 3-6 cm. broad, the rhachis smooth to minutely scaberulous; branches solitary, filiform, loosely dichotomously divided, scaberulous, the lower up to 5 cm. long; pedicles 4-10 mm. long. Spikelets at length widely gaping, 5-6.5 mm. long. Glumes (as seen from the side) lanceolate, acute, keeled in the upper part, chartaceous except for the thinly scarious margins and apex, minutely asperulous, the keel minutely scaberulous, 1- to 3-nerved, the lateral nerves short, greenish or purplish, subequal or the upper slightly longer than the lower, 4.5-6.5 mm. long. Florets usually 3, shorter than the glumes: callus very short, obtuse; internodes of the rhachilla glabrous, about 1.3 mm. long. Lemma elliptical-oblong, bidentate at the apex or shortly bilobed, without a mucro or with a very minute, delicate mucro in the sinus, 3-4 mm. long including the minute callus and the 0.5 mm. long lateral lobes, membranous towards the apex and on the margins, otherwise firm, 7-9-nerved, densely pubescent with short spreading hairs below the middle between the nerves. Palea about as long as the lemma or sometimes a little longer, oblong, emarginate or truncate at the apex, slightly constricted near the middle, densely pubescent and firm below the middle on the back and between the keels and margins, glabrous and membranous above the middle, the keels scaberulous. Anthers 1.5 mm. long. Fruit obovoid, 1.5 mm. long. Fig. 2.

Localities: *New South Wales:* Summit of Mt. Currockbilly, alt. 3,600 feet, covering a patch of moorland, F. A. Rodway, 29.1.1940 (NSW. 935; FAR.); upper slopes of Mt. Budawang, E of Braidwood, alt. 3,630 feet, F. A. Rodway, 28.1.1940 (FAR. 11404; NSW. 1445).

So far as is yet known this species is rare and has a very limited distribution. Its resemblance to native species of the genus *Poa* may cause it to be overlooked by collectors.

3. D. paradoxa R. Br., Prod., (1810), 177; Kunth, Enum., I (1883), 312, and Suppl., (1835), 266. Figured in Agric. Gaz. N.S.W., XII (1901), 547.

Holotype: *New South Wales:* Port Jackson, R. Brown No. 6230 (BM.; duplicates K., MEL.)

Erect, densely caespitose, glabrous perennial, usually found in rather moist situations on sandy or peaty soils, usually about 25-50 cm. high. Culms 3-4-noded, more or less smooth or slightly microscaberulous between the nerves, only shortly exceeding the leaves. Nodes glabrous. Sheaths shorter or longer than the internodes, more or less smooth. Ligule reduced to a ring of minute cilia, scarcely 0.5 mm. long. Blades very long, often 40 cm., often almost equalling the culms, narrow, convolute, sometimes slightly flexuose, slightly rigid, more or less smooth on the outside, grooved and scabrous between the nerves on the inner side. Panicles 7-20 cm. long, usually exserted, more or less lanceolate or pyramidal in outline, with fairly numerous small spikelets borne on slender branches, the branches loosely spreading, the rhachis and pedicels sparsely scabrous, almost filiform, faintly flexuose, slightly thickened at the joints. Spikelets greenish, purplish, or straw-coloured, 4-9 (usually 5-7) mm. long, 3-5-flowered, the florets shorter than or sometimes much exceeding the glumes, rather loosely placed, the rhachilla segments up to about 2 mm. long. Glumes subequal or irregularly equal, 4-6 mm. long, acute or rather obtuse, more or less herbaceous with the membranous margins often scarcely evident, obscurely 3-nerved, microscaberulous. Lemma oblong in outline, 3-4 mm. long including the lobes, shortly bifid at the apex for 1-1.5 mm., pubescent in the lower half, about 9-nerved, herbaceous; lateral lobes short, broad, more or less triangular, obtuse or somewhat acute, membranous in the upper part, unawned; central awn very short, not or scarcely exceeding the lobes, reflexed. Palea either shorter than or shortly exceeding the lateral lobes, linear-lanceolate, bifid, pubescent on the back and between the keels and margins in the lower part, the keels minutely scabrous in the upper part. Anthers linear, 2-3 mm. long. Caryopsis elliptical. Fig. 3.

LOCALITIES: *New South Wales:* Wondabyne, on wet rocks, W. F. Blakely, 10.11.1935 (NSW. 1460); between Berowra and Cowan railway stations, W. F. Blakely, 20.12.1925 (NSW. 1457); French's Forest, W. F. Blakely, 11.1910 (NSW. 1456); Hornsby, on the edge of a sandstone swamp, W. F. Blakely, 12.1914 (NSW. 1454); Dee Why, on moist ground, J. Vickery, 18.11.1933 (NSW. 1451); Dee Why, near Manly, W. M. Carne, 7.11.1914 (NSW. 1448); near Botany Bay, W. Forsyth, 11.1899 (NSW. 1458); La Perouse, W. Forsyth, 22.11.1899 (NSW. 1461); Kogarah, J. H. Camfield, 11.1894 (NSW. 1455); Loftus, J. H. Camfield, 11.1899 (NSW. 1463); Sutherland, J. H. Camfield, 25.11.1893 (NSW. 1459); National Park, at head of waterfall on moist ground, J. Vickery, 14.11.1935 (NSW. 1452); Waterfall, J. Vickery, 12.1933 (NSW. 1453; SYD.); Tianjara Creek, J. Vickery, 1.1.1937 (NSW. 1464); South of Mt. Wombla, 25 miles SW of Nowra, on moorland about 2,000 feet, F. A. Rodway, 2.1.1944 (FAR.); Table Mountain, Milton, R. H. Cambage No. 4045, 27.12.1913 (NSW. 1446, 1462; SYD.); Pigeon House, Milton, R. H. Cambage No. 4299, 26.12.1918 (NSW. 1447); Conjola, W. Heron, 11.1898 (NSW. 1450) and 3.1901 (NSW. 1449).

Victoria: Swamps along Maramingo Creek, 6 miles NE of Genoa and 4 miles from the N.S.W. border, J. H. Willis, 26.1.1947 (MEL.).

Bentham in the Flora Australiensis, cites only the Holotype collection of this species.

A wiry and rather rigid grass, this species is unlikely to be of any particular fodder value. It is found usually in rather swampy places in forest land rather than in pastures, and is seldom abundant.

4. **D. vickeryi** C. E. Hubbard in Hooker's Icones Plantarum, sub t. 3439, (1943).

HOLOTYPE: *New South Wales:* Wentworth Falls, on sandstone, J. Vickery No. K. 14, 11.1931 (K.; duplicates NSW. 936; SYD.).

Rather densely caespitose, usually glabrous perennial, 30-60 cm. high. Culms 2-3-noded, slender, smooth. Sheaths shorter than the internodes, smooth, the lower becoming loose. Ligule reduced to a rather dense ring of cilia 0.5-1 mm. long. Blades inrolled-setaceous or occasionally flattened, often flexuose, 20-30 cm. long, 0.5-1.5 mm. wide, rather sharply pointed, sometimes rather glaucous-green, the lower surface more or less smooth and mostly glabrous or occasionally with a few short tubercle-based hairs, the upper surface rather scabrous and grooved. Panicle exserted, exceeding the leaves, very loose, ovate or broadly pryamidal when expanded, 5-15 (mostly 6-8) cm. long, the branches almost filiform, smooth or microscaberulous, somewhat flexuose, distant, spreading, bearing few spikelets. Spikelets 6-9 mm. long, greenish or purplish, 3- (rarely 4-) flowered, the florets somewhat distant, shorter than or almost equalling the glumes. Rhachilla segments between the lemmas about 1 mm. long. Glumes 6-9 mm. long, rarely longer, subequal or the upper slightly exceeding the lower, acute, sub-3-nerved, the membranous margins rather narrow and inconspicuous, smooth or minutely scaberulous. Lemma broadly oblong, 3.5-4 mm. long including the minute callus, 1 mm. broad when folded, uniformly pilose on the back in the lower part with hairs fairly equal in length, more or less glabrous in the upper part below the sinus, firmly membranous in texture throughout; lateral lobes about 2 mm. long, broad, rather obtuse to acute, not or very shortly awned; central awn about 3-4 mm. long, shortly exceeding the lateral lobes, strongly geniculate below the middle. Palea about 3.5-4 mm. long, shorter than or almost equalling the lateral lobes, narrowly oblong or oblanceolate, obtuse or truncate at the apex, pilose in the lower part with hairs similar to those of the lemma, minutely ciliate along the keels. Anthers brown, about 2-2.5 mm. long. Fig. 4.

Localities: *New South Wales:* Blue Mountains: Sieber, Agrostotheca No. 84 (MEL.; K.); Wentworth Falls, E. Betche, 12.1894 (NSW. 1133); King's Tableland, W. Forsyth, 11.1898 (NSW. 1142); Leura, F. Sulman, 1907 (NSW. 1137); Katoomba, H. Deane, 1.1886 (NSW. 1138); Katoomba, J. H. Camfield, 12.1908 (NSW. 1131); Katoomba, in *Eucalyptus* forest, 3,000-3,300 feet, S. T. Blake Nos. 13911, 13912, 22.1.1939 (BRI.; N.S.W. 1140, 1141); Blackheath, J. H. Maiden, 1.1904 (NSW. 1135); Blackheath, W. Forsyth, 2.1906 (NSW. 1134); Blackheath, J. H. Maiden, 1.1907 (NSW. 937); Blackheath, in exposed low heath, J. Vickery, 16.3.1935 (NSW. 1130); Blackheath, E. N. McKie, 2.1939 (NSW. 1132); Mt. Victoria, J. H. Maiden, 12.1896 (NSW. 1143); Mt. Wilson, J. Gregson, 1.1904 (NSW. 1136); Billynudgell, L. Stephenson, 10.1922 (NSW. 1128; MEL.); Blue Mountains, J. H. Maiden, 1.1907 (AD.).

Bentham, in the Flora Australiensis, included one specimen of this species, viz. "Sieber, Agrostotheca No. 84" under *D. pallida.*

This species provides a link between *D. paradoxa* and the more typical species of *Danthonia,* such as *D. pallida.* Its spikelet closely resembles that of *D. paradoxa* in general appearance and in the shortly cleft lemma, but differs in the longer twisted awn.

D. vickeryi is found chiefly amongst the low, heath-like scrub characteristic of the more exposed parts of the plateau on the Blue Mountains, and is seldom abundant. Such country is unsuitable for grazing, and hence this grass is not considered to be of any economic value. The chief grasses found associated with it are *Danthonia pallida* and a form of the "*Poa caespitosa*" complex.

5. **D. pallida** R. Br., Prod., (1810), 177. Figured in Trin., Spec. Gram., (1828), t. 65; Agric. Gaz. N.S.W., XXXI (1920), 27; Agric. Gaz. N.S.W., III (1892), 947 (sub *D. robusta*).

Holotype: *New South Wales:* Port Jackson, R. Brown, Iter Australiense, 1802-5, No. 6232 (BM.; duplicate K.). The type sheet at the British Museum bears 4 panicles and a detached basal tuft of leaves. Two of the panicles are entirely similar and appear to belong to the detached leaf-tuft on which there are two cut culms. These two bear rather large spikelets (13-18 mm. long) typical of the majority of the specimens enumerated below. The leaves are fine and rather flexuose. While the majority of the specimens of *D. pallida* examined by me are coarser in the leaf, several fine-leafed specimens have been noted and I regard them as conspecific with the coarser forms. The third panicle is attached to a separate rootstock bearing similarly fine leaves; the panicle is smaller and the spikelets shorter (ca. 10 mm.) with smaller florets. However there is no doubt that it is conspecific with the first two. The fourth panicle represents a quite distinct species, *D. longifolia,* and has doubtless been mounted on the sheet in error, being probably a part of R. Brown's No. 6231 of *D. longifolia*; it should not be regarded as forming any part of the Type of *D. pallida.*

Synonyms: *Avena Brownii* Spreng., Syst., I (1825), 336 (based on *D. pallida* R. Br.); *Danthonia robusta* F. Muell., Trans. Vict. Inst., I (1855), 44 (see discussion of the Type of this name under *D. frigida*), non *D. robusta* Auct.; *D. penicillata* F. Muell., Fragm. Phyt. Austral., VIII (1873), 135 pro parte, non Beauv. (1812), non *Arundo penicillata* Labill.; *D. penicillata* var. *pallida* Maiden and Betche, Census of N.S.W. Pl., (1916), 22, the combination incorrectly ascribed there to F. Mueller.

Somewhat variable, robust, densely caespitose, usually more or less glabrous, sometimes slightly glaucous-green or purplish perennial, 60-120 cm. high. Culms 3-4-noded, usually much exceeding the leaves, finely striate, smooth or microscaberulous, the nodes glabrous. Sheaths shorter than or sometimes nearly as long as the internodes, the lower sheaths becoming loose, sometimes purplish, smooth, striate. Ligule ciliate, the cilia 1-6 mm. long. Blades inrolled-setaceous, rather rigid, fairly fine to moderately stout, usually 20-40 cm. (occasionally up to about 70 cm.) long, pointed, sometimes flexuose, typically glabrous and smooth or slightly scaberulous on both surfaces, the inner surface somewhat grooved, but sometimes the lower surface sparsely pilose with tubercle-based hairs and rather rough, very rarely strongly pilose and very scabrous. Panicle exserted, loose, spreading, usually many-flowered, large, 8-35 cm. (usually 10-20 cm.) long, more or less lanceolate in outline, the panicle branches fairly smooth to sparsely scabrous. Spikelets frequently purplish when young, becoming straw-coloured or dark when old, 2-6- (usually 3-) flowered, the florets shorter than the glumes, loosely arranged, the segments of the rhachilla about 1-2 mm. long. Glumes sub-5-nerved, 8-17 mm. (rarely up to 22 mm.) long, usually about 13 mm., subequal, rather narrow, acuminate, the membraneous margins fairly conspicuous, finely scaberulous. Body of the lemma usually 4-5 mm. long (occasionally shorter) including the 0.5-1 mm. callus, uniformly but scarcely densely pilose all over the back and margins with soft hairs all about equal in length, about 1-2 mm. long, 11-nerved, the nerves comparatively conspicuous, membranous or only very thinly indurated, light coloured or greyish at maturity, moderately narrow, about 2 mm. wide when folded; lateral lobes 3-6 mm. long, usually but not always slightly longer than the body, rarely up to twice as long, membranous, more or less microscaberulous, narrowing gradually to an acute point or somewhat truncate at the apex, sometimes with minute often excentric setae rarely exceeding 2 mm. in length; central awn usually about 7-11 mm. long, rarely up to 16 mm., much exceeding the lateral lobes, geniculate, the column about 4 mm., rather dark coloured especially at the base at maturity, somewhat loosely twisted above the joint as well as closely twisted below. Palea nearly equalling the lateral lobes (excluding the awns if present), rarely exceeding them, narrow, almost linear to linear-lanceolate, narrowed somewhat towards the apex, membranous, pilose on the back in the lower part with hairs like those of the lemma, minutely ciliolate on the keels in the upper part, bifid at the apex. Anthers about 4 mm. long, very rarely up to 6 mm., often bright orange-red, orange-yellow or pinkish in colour when fresh, pale when dry. Fruit club-shaped to broadly club-shaped, brown, obtuse at the apex, shorter than the lemma. Fig. 5.

LOCALITIES: *New South Wales*: A. Cunningham, ex. herb. Lehmann (CGE.); New England, C. Stuart (K.; MEL.); near Tenterfield, C. Stuart (K.); Boorolong Run, 18 miles SW of Guyra, rocky situation among hills, over 3,000 feet, granite soil, E. N. McKie No. 2007 (ADW. 381); Moredun Creek, 23 miles NW of Guyra, 3,100 feet, tall tussocks on poor granitic soil, E. N. McKie No. 635, 6.12.1930 (BRI.; ADW.); Narrabri, J. B. Cleland, 26.11.1916 (NSW. 1751; AD.); Sydenham, 4 miles N. of Linton, Barraba district, H. M. R. Rupp, 11.1913 (NSW. 1753); Coonabarabran, G. F. Failes, 12.1903 (NSW. 1755); Harvey Ranges, Peak Hill, J. L. Boorman, 11.1905 (NSW. 1757); Warrumbungle Ranges, W. Forsyth, 10.1899 (NSW. 1765); Moona Plains, Walcha, A. R. Crawford, 1.1885 (MEL.); Kilburnie on Woolbrook-Campfire Road, 4,000 feet, F. M. Bailey, 24.1.1935 (BRI.); Rothbury, E. Mansfield, 12.1902 (NSW. 1761); Mt. Sugar Loaf Range, 14 miles W of Newcastle, F. M. Hilton No. 456, 7.11.1943 (NSW. 1747); Dubbo, J. B. Cleland, 26.11.1916 (MEL.); Wellington Valley, Cunningham No. 102, 11.1825 (K.); Rylstone, D. O. Cross, 12.11.1936 (NSW. 1754); Cudgegong-Pyramul district, 1,500-2,500 feet, on poor sandstone and pipe-clay outcrops, M. V. O'Reilly, 27.11.1939 (NSW. 1764); Bowan Park, W. F. Blakely, 11.1907 (NSW. 1758); near Capertee, D. Thomson, 20.11.1912 (NSW. 1739); Blue Mountains, received from Chas. Moore, 9.1872, No. 92 (K.); (this specimen cited in Benth. Fl. Aust. as *D. semiannularis*); Blue Mountains, J. H. Maiden, 1.1907 (NSW. 1745, 1746; AD. ex herb. Nurmberger Botanischer Tauschverein, J. Kaulfuss); Blue Mountains, E. Betche, 12.1882 (NSW. 1731); Blue Mountains, J. E. Tennison-Woods, 1882 (MEL.); Hazelbrook, R. A. Black, 20.5.1927 (RAB.); Wentworth Falls, O. D. Evans, 12.1926 (SYD.); Wentworth Falls, J. Vickery, 11.1931 (SYD.); Katoomba, on hillside in *Eucalyptus* forest, 3,000-3,400 feet, S. T. Blake No. 13933, 23.1.1939 (BRI.; NSW. 1736); Katoomba, on sandstone, J. Vickery, 10.1930 (NSW. 1741; K.; BRI.); Tomah to Cockatoo, W. Forsyth, 11.1900 (NSW. 1742); Blackheath, E. Cheel (NSW. 1744); Blackheath, J. Dykes, 1.1890 (NSW. 1743); Blackheath, J. H. Maiden, 4.1899 (NSW. 1738); Mt. Victoria, E. Cheel, 12.1900 NSW. 1730); Mt. Victoria, O. D. Evans, 21.1.1930 (SYD.); Lithgow, J. Vickery, 2.1.1936 (NSW. 1740); near Bathurst, Cunningham No. 239, 11.1822 (K.); Barren Hills north of Bathurst, A. Cunningham (K.); Barren hills north of Bathurst, ex herb. Gen. Wm. Munro (K.); Oberon, Ralph, 1.1918 (NSW. 1735); Hornsby, W. F. Blakely, 12.1914 (N.S.W. 1771, 1772) and 10.1914 (NSW. 1767); Parramatta, Woolls (MEL.); Rockdale, E. C. Andrews (NSW. 1770); Mt. Jellore, E. Cheel, 16.11.1912 (NSW. 1726, 1728); Yerranderie, R. H.

Cambage No. 3122, 2.12.1911 (SYD.); Mittagong, E. N. McKie, 1.12.1941 (NSW. 1775); Wingello, J. L. Boorman, 12.1913 (NSW. 1787); Goulburn district, on low-fertility shale and slate upland, L. G. Kaleski, 26.11.1939 (NSW. 1781); Towrang, D. Thomson, 15.11.1912 (NSW. 1773); Barber's Creek, J. H. Maiden, 12.1897 (NSW. 1783); Canberra, R. A. Black, 7.11.1931 (RAB.; K.); southern slopes of Black Mt., Canberra, W. Hartley, 11.1930 (CAN.); Queanbeyan, on slate formation, R. H. Cambage No. 3362, 13.12.1911 (NSW. 1786); Wagga Wagga, between Murrumbidgee and Lachlan Rivers, J. R. Garland No. 13, 1888 (MEL.); Wee Jasper-Tumut Road, at high altitude, J. Vickery, 8.1.1940 (NSW. 1779); Temora, J. W. Dwyer, 11.1916 (NSW. 1788; K.); Milton, Bauerlen, 12.1883 (MEL.); Edwards River, Riverina, H. E. Sullivan, 1876 (MEL.); Cooma, J. H. Maiden, 12.1896 (NSW. 1778); Monaro district, W. Bauerlen No. 194, 12.1886 (MEL.); Bombala, W. Bauerlen No. 282, 12.1886 (MEL.); Bega, on the poorer soils, E. Breakwell, 12.1913 (NSW. 1785); Cathcart, J. Vickery, 14.1.1940 (NSW. 1777).

Victoria: In Nova Hollandia, Sieber (MEL.); Sieber, Agrostotheca No. 85 (MEL.; K.); and No. 92 (K.); Hume (i.e., Murray) River, Jephcott, 1883 (MEL.); Victorian Alps, C. Walter, 1.1892 in part (MEL.); Alpine Flats, D. Sullivan, 1884 (MEL.); Lower Mitta Mitta, F. Mueller, 1.1874 (MEL.); Snowy Creek, T. C. Martin, 1887 (MEL.); Daylesford, R. Wallace, 1880 (MEL.); Wangaratta, J. B. Cleland, 1.1913 (NSW. 1798); Peichella, comm. E. J. Sonnenberg, 22.11.1934 (K.); Whourouly, R. A. Black, 25.10.1935 (RAB.); Mt. Buffalo, on rocky hillsides in *Eucalyptus* forest, ca. 4,500 feet, S. T. Blake No. 7321, 25.1.1935 (BRI.; NSW. 1794); Mt. Buffalo, on granite, 4,300 feet, R. H. Cambage No. 3747, 19.1.1913 (NSW. 1793; Syd.); Archdale, R. A. Black, 19.11.1931 (RAB.); Omeo-Hotham Road, R. A. Black, 30.1.1938 (RAB); Puckapunyal, C. Davis, 10.11.1942 (NSW. 1790); Tooborac, Campaspe River, C. W. Holloway, 1885 (MEL.); Castlemaine, P. R. H. St. John and L. St. John, 18.11.1935 (MEL.); Mt. Speculation, Barry Mts., 5,600 feet, J. H. Willis, 2.1.1945 (MEL.); The Twins, Mt. St. Bernard, A. J. Tadgell, 12.1914 (MEL.); Mt. St. Bernard, J. H. Maiden, 1.1900 (NSW. 1797); Campbells Creek, Mason, 12.1886 (MEL.); Delatite River, R. Thom, 1890 (MEL.); Mt. Buller, F. Mueller (MEL.); Towards Mt. St. Bernard, 3,000 feet, A. J. Tagell (MEL.); Stony slopes of Mt. Buller, F. Mueller, 22.3.1853 (Holotype of *D. robusta* F. Muell.), (MEL.; K. probably a duplicate); Longlea, near Bendigo, D. J. Paton, 11.1921 (MEL.); Ararat, C. Green (MEL.); Ballarat, F. Mueller (MEL.); Red Jacket Creek, Gargurevich, 1874 (MEL.); Alexandra, R. A. Black and P. F. Morris, 10.1935 (K.); Healesville, R. A. Black, 18.12.1939 (RAB.); Mt. Dandenong, P. R. H. St. John, 1.1.1903 (MEL.); Ringwood, herb. A. Morrison, 8.12.1887 (K.); Research, A. Meebold No. 21590, 11.1936 (NSW. 1792); Lilydale, Bissill, 12.1874 (MEL.); Lilydale, A. H. S. Lucas, 11.1885 (NSW. 1795); Orbost, C. Walter, 11.1900 (MEL.); Orbost, C. H. Grove, 2.1905 (NSW. 1796); Orbost, C. H. Grove, 1905 (MEL.); Mt. Buck, Orbost, E. E. Pescott, 9.1900 (ADW. 397); Stony ridges on the Mitchell River towards Dargo, F. Mueller (MEL.); near Dandenong Ranges, J. E. Dixon, 1891 (MEL.); Forest Creek, F. Mueller (K.); in the stringybark tree forest near Forest Creek, F. Mueller, 12.1852 (MEL.); Walhalla, Gippsland, Howitt, 1885 and 1887 (MEL.); Thomson River, A. W. Howitt, 1888 (MEL.); Flourbag Spur, Thomson River, Gippsland, Howitt No. 12, 1884 (MEL.); Macalister River, Gippsland, A. W. Howitt, 1887 (MEL.); Chum Creek Valley, A. J. Ewart, 12.1910 (MEL.).

Western Australia: King George's Sound, Bagster (K.). This record is surprising and requires substantiation by future collectors.

Widely distributed throughout the Coast and Tablelands of New South Wales. It is generally found on upland, acid soils of low fertility, derived from sandstones, shales and slates. In forest country it often forms large tussocks where other ground vegetation is sparse. It is too coarse to be much eaten by stock, though the heads are palatable to cattle. It is less commonly found on the richer soils which are more fit for intensive pastures. In some districts it is known as "Mountain Tussock". Standardised Common Name is "Silvertop Wallaby Grass".

Of the specimens cited under *D. pallida* by Bentham in the Flora Australiensis which I was able to examine at Kew all have been correctly referred to that species except for Sieber, Agrostotheca No. 84 which is *D. vickeryi.* I was unable to locate the following specimens cited by him: N.S.W., Woolls; Vic.; Barossa Range, Lower Mitta-Mitta; W.A.; Blackwood River, Oldfield, Walcott. Bentham also named as *D. pallida* a number of other specimens which he did not cite, and most of these are included in the enumeraton of specimens above. One he so named, from "Liverpool Plains, Chas. Moore, 9/74, No. 115" is *D. richardsonii.*

Under this species Bentham described *D. pallida* var. *subracemosa* Benth. The two syntypes are mounted on the same sheet. They are not conspecific. That from "Macleay River, Beckler, herb. F. Mueller, 1877" is *D. linkii*. That from "Warwick, Beckler, herb. F. Mueller, 1877" is an imperfect specimen, but appears to be close to *D. purpurascens*. In the National Herbarium, Melbourne, the apparent duplcates of the two syntypes have the locality labels transposed.

6. **D. clelandii** J. Vickery in Contrib. N.S.W. Nat. Herb., I, No. 5 (1950), 297.

HOLOTYPE: *South Australia:* Upper Waterfall Gully, J. B. Cleland No. H.262, 30.10.1926 (NSW. 1126; duplicate JBC.).

Rather robust, densely caespitose perennial, about 75 cm. high. Culms 3-4-noded, more or less smooth except scabrous just below the panicle, the nodes glabrous. Sheaths usually shorter than the internodes, ofter becoming loose, glabrous, smooth or very finely scaberulous. Ligule reduced to a ring of rather dense, short cilia 0.5 mm. long. Blades more or less setaceous, or the culm leaves flat but often inrolled on drying, narrow, 0.75-2.0 mm. wide, gradually narrowed into a rather sharp point, about 30 cm. long, more or less smooth on the lower surface, scabrous to finely scabrous-pubescent and grooved on the upper surface. Panicle long-exserted, much exceeding the leaves, 8-13 cm. long, loose, more or less spreading, the branches distant, each bearing few spikelets. Rhachis scabrous to finely scabrous-pubescent, somewhat angular. Spikelets 4-5-flowered, the florets much shorter than the glumes. Glumes 16-20 mm. long, subequal, gradually narrowed into the very narrowly truncate or acute tip, greenish or purplish, the hyaline margins rather conspicuous, scaberulous, the lower glume sub-9-nerved, the upper sub-7-nerved. Body of the lemma 5 mm. long including the 1 mm. callus, of medium breadth, pilose with hairs scattered all over the back below the sinus, sometimes these hairs rather sparse, those of the lower row and upper lateral tufts sometimes rather longer; lateral lobes about 8 mm. long including 4 mm. awns, with membranous margins, scaberulous, gradually narrowed into the awns; central awn about 16 mm. long, rather firm, twisted below the joint, and also to some extent above it. Palea about 8 mm. long, exceeding the sinus but shorter than the lateral lobes, bifid at the apex, ciliate on the keels, narrowly oblanceolate, up to 1.5 mm. broad, firm especially in the lower part, pubescent on the back in the lower part, the hairs much shorter than those of the lemma. Anthers 4-5 mm. long, orange-red or salmon-red. Fig. 6.

LOCALITIES: *South Australia:* Upper Waterfall Gully, J. B. Cleland No. 263, 30.10.1926 (K.); on railway line just to east of National Park, J. B. Cleland, 12.11.1938 (JBC.); in *Eucalyptus obliqua* forest, Summertown, Mt. Lofty, J. B. Cleland, 9.11.1940 (JBC.); Waterfall Gully, J. B. Cleland, 11.1920 (NSW. 1123; JBC.), and 28.11.1931 (K.557); Mt. Lofty, J. Vickery, 6.11.1937 (NSW. 1125); Mt. Lofty Ranges, O. E. Menzel, 11.1897 (AD.); Mt. Lofty, J. M. Black, 12.1936 (ADW); Mt. Lofty, G. H. Clarke, 12.1936 (ADW); Forest Range, J. B. Cleland, 16.11.1946 (JBC.; NSW. 2664); Forest Range to Carey's Gully, J. B. Cleland, 18.12.1943 (JBC.; NSW. 2667); Carey's Gully to Bridgewater, J. B. Cleland, 11.11.1944 (JBC.; N.S.W. 2665); Basket Range to Uraidla, J. B. Cleland, 20.11.1943 (JBC.; NSW. 2666); Basket Range, J. F. Bailey, 29.11.1930 (K.).

7. **D. frigida** J. Vickery in Contrib. N.S.W. Nat. Herb., I, No. 5 (1950), 298.

HOLOTYPE: *New South Wales:* Mt. Kosciusko, about 6,000 feet, J. Vickery, 13.1.1940 (NSW. 1097).

Very robust, densely caespitose, glabrous, light-green coloured perennial, forming large tufts often 2 feet in diameter, often growing between rocks at high altitudes. Basal leaves dense with very broad (10-13 mm.), flat, thick, conspicuously striate sheaths, the old truncate sheaths tough and often somewhat curved, remaining adhering around the stout, erect rhizome and base of the culm as a dense sheath. Culms mostly 2-3 feet high, often stout at the base, sometimes more or less flattened and 2-3-noded above the base, glabrous, smooth, shining, striate, the nodes glabrous. Sheaths of the culm often longer than the internodes, the lower becoming loose, smooth, striate, usually noticeably larger in diameter than the culm they enclose. Ligule a ring of short cilia, mostly 0.5-1.5 mm. long. Blades of the lower leaves more or less flat at the base, strongly inrolled on drying, grooved on both sides, the grooves deep on the upper side, rigid, thick, very distantly scabrous on the margins, otherwise more or less smooth except scabrous in the grooves of the upper surface, polished on the lower surface, 4-6 mm. wide at the base, gradually narrowed into a subulate-pointed tip, often 30-60 cm. long or more; upper culm leaves finer and narrower, often exceeding the panicles. Panicles somewhat contracted, many-flowered but scarcely dense, more or less lanceolate in outline, not or scarcely completely exserted from the uppermost leaf-sheath, the panicle branches divided near their bases, hirsute and often with a tuft of longer hairs at the junction of the branches. Spikelets light-greenish, fading to pale straw-colour, 4-8- (usually 5-7-) flowered, the florets generally exceeding the glumes, rather loosely placed, the rhachilla segments 1-2 mm. long. Glumes 8-13 mm. long, subequal or irregularly unequal, acute or narrowly truncate, firmly membranous almost throughout, the lower generally 1-nerved, the upper 3-5-nerved at the base, smooth to obscurely microscaberulous. Body of the lemma 4-7 mm. long including the 1 mm. densely hairy callus, lanceolate in outline when folded, more or less uniformly hairy all over the back, the hairs about equal in length in all parts, generally 0.75-1.5 (occasionally up to 2.5) mm. long, scarcely dense; lateral lobes usually about equal to the body of the lemma (about 6 mm. long), with a distinct membranous margin, narrowing gradually into an acuminate, shortly awned tip, the awns about 1-3 mm. long or sometimes (especially in the upper florets) the lateral lobes much shorter, acute and more abruptly narrowed into the short awn; central awn about 8-15 mm. long, exceeding the lateral lobes, geniculate, slightly twisted below the bend, often dark-coloured in the lower part. Palea much exceeding the sinus, shorter than the lateral lobes, about 8 mm. long, bifid at the apex, linear to linear-lanceolate, glabrous on the back but densely pilose between the keels and margins in the central part, densely and finely ciliolate on the keels in the upper part. Anthers about 4 mm. long, orange-yellow. Fig. 7.

Localities: *New South Wales:* Mt. Kosciusko, about 6,000 feet, J. Vickery, 1.3.1933 (NSW. 1090; Syd.; K.); Mt. Kosciusko, E. Betche, 2.1893 (MEL.); Mt. Kosciusko, 5,500 feet to summit, J. H. Maiden, 1.1899 (MEL.); Mt. Kosciusko, summit, J. H. Maiden and W. Forsyth, 1.1899 (NSW. 1094, 1096, 1098), and Treeline to 7,000 feet, 2.1899 (NSW. 1091), and 1.1899 (NSW. 1095); Munyong Mts. up to the summit of Mt. Kosciusko, F. Mueller, 1.1855 (MEL.); Summits of Mt. Kosciusko to 7,000 feet, granite form, P.F.W.S., 2.1.1884 (MEL.); Mt. Kosciusko, R. Helms, 2.1901 (NSW. 1093); Betts Camp to Mt. Kosciusko, J. H. Maiden, 16.2.1914 (NSW. 1092); Kosciusko, W. Hartley, 27.1.1935 (CAN.); Lake Kootapatamba, Kosciusko Plateau, ca. 6,800 feet, J. H. Willis, 4.2.1946 (MEL.); Munyong Mountains, 5-6,000 feet, F. Mueller (MEL.).

This is the alpine species which has been widely known under the name of *D. robusta* F. Muell., Trans Vict. Inst., I (1855), 44. Mueller's holotype specimen of *D. robusta*, from the stony slopes of Mt. Buller, coll. 22.3.1853, is in the National Herbarium, Melbourne, and a duplicate is at Kew. Examination of his specimen shows that it is undoubtedly a very robust specimen of *D. pallida* R.Br. The holotype and the duplicate each consist only of the upper part of the culm and panicle, the basal parts of the plant being absent. The upper sheaths are unusually broad for *D. pallida*, and the inflorescence is at a stage which suggests in appearance that of *D. frigida*. However the spikelets offer several characters which permit of their differentiation and serve as the basis for my conclusions. These may be conveniently summarised here.

D. pallida	*D. frigida*
Lemma membranous, the lateral lobes uniformly membranous.	Lemma firm, the lateral lobes with a distinctly differentiated membranous margin.
Central awn fine, brown, closely contorted in the lower part.	Central awn coarse, geniculate but only very lightly twisted in the lower part.
Palea pilose on the back in the lower part with hairs like those of the lemma.	Palea glabrous on the back.

The identity of the holotype of *D. robusta* is particularly unfortunate, since Mueller himself subsequently identified specimens of *D. frigida* from the Munyong Mountains with his *D. robusta,* and this interpretation has been followed by Australian authors up to the present time. *D. pallida* undoubtedly occurs in the Mt. Buller and Mt. Kosciusko areas, though chiefly on the lower slopes. In subsequent notes on *D. robusta* in Fragm. Phyt. Austral., VIII (1873), 136, Mueller states that it is a grass up to 5 feet in height. This height is more commonly attained by *D. pallida* than by *D. frigida.* In the same paragraph he refers to characters of the spikelet, such as the spikelet (florets) longer than the bracts (glumes), and the awn flat at the base, sometimes not twisted at the base (characters which doubtless refer to *D. frigida*), or sometimes conspicuously spiral in the lower part (a character of *D. pallida*). It seems evident that at that date he was confusing the two. The identity of the holotype specimen, however, leaves no alternative but to regard the name *D. robusta* F. Muell. as a synonym of *D. pallida* R.Br. and to recognise the alpine species with which Mueller confused it as *D. frigida.*

Bentham, in the Flora Australiensis, followed Mueller in his delineation and interpretation of *D. robusta,* and the 2 specimens there cited are respectively *D. pallida* and *D. frigida.*

In habitat, habit and many characters of the inflorescence and spikelet, *D. frigida* resembles several New Zealand species such as *D. flavescens* and its allies. Through the courtesy of Dr. V. D. Zotov, I have been able to examine the following New Zealand species determined by him:—*D. crassiuscula, D. flavescens, D. cunninghamii, D. raoullii* (= *D. rigida* Raoul) and *D. bromoides.* I consider that *D. frigida* is distinct from any of these. They all have the hairs on the back of the lemma restricted to the margins alone, or to the margins and two vertical dorsal lines, whereas in *D. frigida* the hairs are scattered more uniformly over the back. These species notably resemble *D. frigida* in the presence of the conspicuous broad leaf-bases retained at the base of the plant, and ecologically they appear to occupy a similar position in the New Zealand flora.

D. frigida may be of some minor economic importance as a constituent of the vegetation occurring at high altitudes, where it is one of the more palatable grasses, producing a considerable bulk of leafy growth. Such areas are used for summer grazing to a limited extent.

8. **D. carphoides** F. Muell. ex Benth., Fl. Austral., VII (1878), 592. Figured in Agric. Gaz. N.S.W., III (1892), 540; Turner, Australian Grasses, (1895), 18.

Lectotype: *Victoria:* Melbourne, Adamson, 2.11.1853 (K.). I have selected this specimen as it is a better and more ample specimen than the other syntypes.

Rather small, caespitose perennial, 10-40 cm. high, erect or somewhat geniculate at the nodes. Culms smooth, or rarely microscaberulous between the nerves, slender, much exceeding the leaves, about 3-noded, the nodes glabrous. Sheaths shorter than the internodes, usually pilose, rarely subglabrous. Ligule reduced to a ring of short cilia, about 0.5-1 mm. long, sometimes with a few longer cilia at the sides. Blades rather short, 3-20 cm. long, fine, inrolled or rarely slightly flattened, pointed, more or less setaceous, pilose with tubercle-based hairs or rarely subglabrous, scabrous between the grooves on the upper surface. Panicle usually much exserted, short, ovate, about 1.5-4 x 1.5-2.5 cm., compact, dense but with few spikelets, the branches and pedicels short, scabrous-pubescent on the inner sides of the branches. Spikelets 7-10 mm. long, 3-5-flowered, the florets not densely packed, scarcely exceeding the glumes and at length much divergent, greenish tinged with purple and at length straw-coloured. Glumes sub-equal, broad, with a rather conspicuous, wide, membranous margin, narrowed towards the apex into a short, acute or rarely shortly acuminate tip, strongly cymbiform, 5-9-nerved, smooth, or scaberulous on the nerves. Lemma about 6-8 mm. long, including the lateral lobes, the body about 4-6 mm. long including the 0.5 mm. callus, more or less obliquely turbinate, pilose on the back with hairs about 2 mm. long except immediately above the pilose callus, and with a row of tufts of hairs up to 4 mm. in length placed about 1-2 mm. below the sinus, the hairs all rather stiff and firm, stiffly spreading at maturity, the lemma indurated and usually rugulose on the back between the hairs, not shining, pale straw-coloured, about 9-nerved; lateral lobes about 2 mm. long, broad, obtuse or abruptly narrowed into a short, acute or acuminate point, but not or very minutely awned, with a narrow to rather broad membranous margin, the veins moderately conspicuous, firm in texture; central awn equalling or shortly exceeding the lateral lobes, rarely by more than 2 mm., reflexed. Palea rather broadly obovate, narrowed into the base, obtusely truncate or very slightly and obtusely bifid at the apex, pubescent on the back in the lower two-thirds, sometimes also with a few hairs between the keels and the margins, finely ciliolate on the keels, reaching to the sinus of the lemma, about 2.3 mm. wide. Anthers pale, small, about 0.5-1.5 mm. long, the florets probably often cleistogamous. Fruit obovate, about 2 mm. long, the embryo half as long, usually more or less fully formed before the glumes are completely divergent. Fig. 8.

LOCALITIES: *New South Wales:* Little Lagoon, 5 miles S of Guyra, 4,400 feet, on basaltic soil, E. N. McKie No. 2001, 5.4.1931 (ENM.); Armidale, Perrott, Syntype (K.); Macquarie River, C. Moore, Syntype (K.); Interior of N.S.W. towards the Macquarie, C. Moore (MEL.); Gular, J. B. Cleland, 30.10.1911 (NSW. 1179); Orange, Molong and Gular J. B. Cleland, 1914 (AD.); Bathurst, H. Deane, 11.1886 (NSW. 1172); Bathurst, R. Helms, 8.11.1900 (NSW. 1175); Bathurst Experiment Farm, B. D. Ament, 1.1940 (NSW. 1192); Wallerawang, J. H. Maiden, 11.1899 (NSW. 1176); Sunny Corner, J. L. Boorman, 11.1899 (NSW. 1180); Ingleburn, F. M. Hilton No. 441, 28.10.1943 (NSW. 1169); Braidwood district, J. L. Boorman, 2.1909 (NSW. 1185); Braidwood, E. Cheel, 10.1932 (NSW. 1170); Experimental Plots, C.S.I.R., Canberra, F. W. Hely: 28.1.1941, No. 182-6, seed collected from 10 miles north of Goulburn (NSW. 1191); No. 186-4, seed collected from 5 miles north of Bowral (NSW. 1190); Nos. 2-4 and 2-9, seed collected from Black Mt., Canberra (NSW. 1186 and 1187); near Tharwa, on rocky hillsides in *Eucalyptus* forest, 2,000 feet, S. T. Blake No. 7544, 2.2.1935 (BRI.; NSW. 1188); near Yass, Mrs. Calvert, Syntype (K.); Canberra, R. H. Cambage Nos. 2958 (NSW. 1173), 2953 (SYD.), and 3059 (NSW. 1174; SYD.), 3.11.1911; Canberra, J. Vickery No. 196, 15.11.1931 (NSW. 1168); Canberra, R. A. Black, 7.11.1931 (RAB.); Canberra, W. Hartley, 3.11.1930 (CAN.); Wagga Wagga; R. Helms, 5.1900 (NSW. 1182); Wagga Experiment Farm, E. Breakwell, 1917 (NSW. 1183, 1184; K.); South Goulburn, J. Lumsden, 10.1906 (NSW. 1177); Gerogery, E. J. McBarron No. 2618, 17.11.1948 (NSW. 6764); Albury, R. A. Black and P. F. Morris, 10.1935 (K.); Thurgoona via Albury, E. J. McBarron No. 2560, 9.11.1948 (NSW. 6765).

Victoria: Gunbower Is., (Murray), H. B. Williamson, 10.1913 (MEL.); Dimboola, C. Walter, 3.1904 (MEL.); Dimboola, St. E. D'Alton, (MEL.); Minyip, H. B. Williamson, 10.1928 (MEL.); Clarendon, Tepper No. 1085, 15.10.1882 (MEL.); Tansdasa, E. E. Pescott, 10.1900 (ADW. 396), Preston, F. H. F. Baker, 11.1921 (MEL.); Ravenswood, SE of Bendigo, A. J. Tadgell, 11.1935 (MEL.); St. Arnaud, E. J. Sonenberg, 30.9.1935 (K.); Chewton, A. J. Tadgell, 10.1937 (MEL.).

Tasmania: Cliffs at the Cataract Gorge, S. Esk River, Launceston, W. M. Curtis 10.1943 (K.).

South Australia: Port Elliot, Tate herbarium, 11.1896 (AD.); Hillside Bluff, Encounter Bay, J. B. Cleland, 31.8.1924 and 15.11.1930 (JBC.); Encounter Bay, Hussey, 1895 (MEL.); Hallet, S. Dixon, 12.11.1886 (AD.); Smithfield, 2.10.1881 (AD.).

I have examined three of the four specimens cited by Bentham in the Flora Australiensis and these are all referable to *D. carphoides*.

D. carphoides is a small but useful species in natural pastures, especially on the Tableland districts of central and southern New South Wales.

8a. Var. **angustior** n. var.

Ab typo glumis moderate latis, plus minusve sensim angustatis in apicibus acutis vel acuminatis paullo cymbiformis; palea plus minusve late lanceolato-elliptica (in medio latissimo) angustiore, 1-1.5 mm. lata; spiculis 2-floribus, flosculis quam glumis brevioribus; lemma angustiore turbinata, corpore 3-4 mm., lobis lateralibus 3-4 mm., ad apicem aequaliter angustatis variat.

HOLOTYPE: *Tasmania:* Domain, L. Rodway, 11.1894 (HO.).

Differs from the species in the glumes only of moderate width, tapering more or less gradually into the acute to acuminate tip, slightly cymbiform; palea rather broadly lanceolate-elliptical (broadest about the middle), narrower than in the typical form, 1-1.5 mm. wide; spikelets 2-3-flowered, the florets shorter than the glumes; lemma less broadly turbinate, the body 3-4 mm. long, the lateral lobes 3-4 mm. long, narrowing evenly into an acute tip.

LOCALITIES: *Victoria:* Preston, F. H. F. Baker, 11.1921 (MEL.).

Tasmania: Gorge, Launceston, W. M. Curtis, 10.1943 (HO.); Cornelion Bay, H. D. Gordon, 30.10.1937 (HO.).

South Australia: Hindmarsh Valley, Encounter Bay, J. B. Cleland, 1.1922 (NSW. 1166).

9. **D. geniculata** J. M. Black in Trans. & Proc. Roy. Soc. S. Austral., LIII (1929), 261.

LECTOTYPE: *South Australia:* Keith, J. M. Black, 23.11.1917 (JMB.; duplicates MEL.; K.; NSW. 1377).

Erect or somewhat geniculate-ascending, caespitose perennial, very slender, 15-45 (mostly 20-35) cm. high. Culms very fine, smooth, exceeding the leaves, about 3-noded. Sheaths fine, shorter than the internodes, more or less smooth. Ligule finely ciliolate. Blades filiform, inrolled, distantly pubescent with short tubercle-based hairs. Panicle small, contracted, more or less ovoid, 1-5 cm. long with 3-15 (rarely more) spikelets, the panicle branches short, scabrous-pubescent to pilose. Spikelets mostly 4-5-flowered, usually rather pale-coloured, the florets a little shorter than the glumes. Glumes 5-8 mm. long, moderately broad, broadest about the middle, more or less oblong, shortly narrowed into the acute or sometimes almost obtuse point, subequal or the upper glume slightly exceeding the lower, about 7-nerved. Body of the lemma pale, small, about 2.5 mm. long including the 0.75 mm. callus, more or less uniformily pilose all over the back or the hairs more concentrated in an upper and lower series with rather sparse hairs on the back, the lower hairs about as long as the upper, the callus only sparsely hairy; lateral lobes 4-6 mm. long, very acuminate, and either scarcely awned or with a short awn (up to 2 mm. in some specimens), firm with a membranous outer margin; central awn not or scarcely exceeding the lateral lobes, slightly twisted at the base. Palea reaching to the sinus, obovate, obtuse, or obscurely bifid, pubescent on the back, ciliolate on the keels, and with a few cilia between the keels and margins. Anthers 0.5-1 mm. long, pale. Fruit oblanceolate, about 1 mm. long, rather dark brown. Fig. 9.

Localities: *Victoria:* Moysten, D. Sullivan, 22.11.1873 (MEL.); Melbourne, between Sandringham and Beaumaris, L. S. Smith No. M49, 30.5.1943 (BRI.); Sandringham, A. J. Tadgell, 11.1905, 1.1906 and 12.1941 (MEL.); Melbourne Botanic Gardens, J. Vickery, 5.11.1937 (NSW. 1352); between Melbourne and Tooradin, in damp sandy places, S. T. Blake No. 7269, 20.1.1935 (BRI.; NSW. 1356); Dandenong, A. Meebold No. 21591, 11.1936 (NSW. 1357); Tooradin, J. Vickery, 20.1.1935 (NSW. 1358); Coast ridges of Drysdale, F. Mueller, 12.1883 (MEL.); West of Port Arlington, P. F. Morris, 1934 (MEL.); near Geelong, W. B. Wilson, 21.11.1885 (MEL.); Geelong, Stephen, 12.1921 (MEL.); Port Phillip (MEL.); Mentone, Port Phillip Bay, P. A. H. St. John, 22.11.1902 (MEL.); Frankston, H. B. Williamson, 1932 (K.); Musk Gully, Arthur's Seat, J. H. Willis, 10.11.1940 (MEL.); Rickett's Point, Black Rock, comm. E. J. Sonenberg, 10.11.1935 (K.); Hall's Gap, Grampian Mts., Josephine E. Tilden South Pacific Plants No. 963, 12.1912 (K.).

South Australia: Mt. Crawford, J. B. Cleland, 22.11.1939 (JBC.; NSW. 1354); Mt. Lofty, E. H. Ising, No. 2322, 24.11.1933 (K.); Adelaide, cult. at Waite Institute, No. Ga107, C. M. Eardley, 17.3.1934 (ADW. 374, 378 in part); Adelaide, cult. at Waite Institute, No. Ga131 (ADW. 373; K.); Adelaide, cult. at Waite Institute, J. M. Black, 1.1932 (JMB.); Adelaide, cult. at Waite Agric. Exp. Sta., No. Ga107, H. C. Trumble, 1930 (MEL.); Adelaide, cult. at Waite Institute, No. Ga130, H. C. Trumble, 1930 (K.); Mt. Barker, F. Liebelt, 6.1936 (ADW. 378 in part); Mt. Barker, J. B. Cleland, 4.12.1943 (JBC.; NSW. 2675); Kybobolite Experiment Station, N. S. Tiver, 7.11.1945 (ADW. 70); Mylor, J. B. Cleland, 18.12.1922 (JBC.; NSW. 1353) and 11.1922 (NSW. 1351; ADW. 372); Mt. Compass, F. M. Hilton, 10.11.1941 (RAB.); Bordertown, J. M. Black, 26.11.1917, Syntype (JMB.); Swamps near Mt. Benson, Engelhart, 1895 (MEL.); Millicent, J. M. Black, 4.11.1917, Syntype (JMB.); Narracoorte Creek, SE of South Australia, probably R. Tate, 26.1.1882 (AD.); Dismal Swamp near Mt. Gambier, J. M. Black, 22.11.1922, Syntype (JMB.; AD.); Kangaroo Island, Rocky River, J. B. Cleland, 18.11.1924 (JBC.; JMB., Syntype; NSW. 1355; K.).

Bentham named a specimen of this species, viz., "Victoria, Sullivan" as *D. setacea*, but did not specifically cite it in the Flora Australiensis.

Though small and not outstanding in quality, this species should be a useful constituent of natural pastures in southern parts of the continent with a fairly good rainfall.

10. D. monticola J. Vickery in Contrib. N.S.W. Nat. Herb., I, No. 5 (1950), 299.

Holotype: *New South Wales:* Lithgow, J. Vickery, 2.1.1936 (NSW. 1359).

Erect, densely caespitose perennial, up to 45 cm. high. Culms smooth, fairly slender, 2-3-noded. Sheaths shorter than the internodes, slender, hirsute with short hairs. Ligule reduced to short cilia. Blades inrolled-setaceous, fine but coarser than those of *D. geniculata*, firm, hirsute with short, often appressed, scattered hairs, up to 15 cm. long, much shorter than the culms. Panicles lanceolate to ovate in outline, much exserted, contracted or reduced almost to a raceme, with about 5-15 spikelets, the panicle branches short, rather densely pubescent to pilose. Spikelets often purplish or at length straw-coloured, 4-6-flowered, the florets much shorter than the glumes. Glumes 8-11 mm. long, broadest in the lower third, acuminate, subequal, or the upper frequently but not regularly exceeding the lower, about 9-nerved, the margins comparatively firm, purplish, micro-scaberulous. Lemma more or less ovate-lanceolate in outline, bearing two series of hairs, the back smooth and shining between them or with a few scattered hairs, rarely rather densely hairy but then the lower series of hairs always much shorter than the upper series, the lower series reaching above the base of the upper, the upper series placed distinctly below the sinus and consisting of hairs up to 3 mm. long, and distinctly longer than the lower series; body of the lemma usually 2-2.5 mm. long including the 1 mm. callus; lateral lobes not broad, rather triangular, the outer margins membranous, narrowing a little abruptly into the fine awns, the whole lobes about 7-8 mm. long; central awn shortly but distinctly exceeding the lateral lobes, brown and twisted in the lower part. Palea obovate-spathulate or obovate-oblong, very obtuse, minutely bifid, very minutely ciliolate on the keels in the upper part, sometimes sparsely hirsute on the back in the lower part, exceeding the sinus. Anthers deep yellow, about 1 mm. long. Fruit obovate, about 1.5 mm. long, 1 mm. broad. Fig. 10.

Localities: *New South Wales:* Top Dam, Moredun Creek, 25 miles NW. of Guyra, 3,100 feet, E. N. McKie No. 643, 6.12.1930 (BRI.; K.; NSW. 1367), and No. 356, 21.4.1930 (NSW. 1506, 2529), these two specimens more pilose on the back of the lemma than is typical in the species; Moredun Creek Dam, E. N. McKie, 30.12.1947 (NSW. 11361); Top Dam, E. N. McKie, 29.12.1947 (NSW. 11360); Limestone Creek, E. N. McKie, 29.1.1947 (NSW. 11359); Walcha district, A. R. Crawford, 11.1898 (NSW. 1262) and 6.1900 (NSW. 1361, 1369; MEL.); Home Rule near Gulgong, J. L. Boorman, 12.1916 (NSW. 1372); Rylstone, D. O. Cross, 26.12.1942 (NSW. 1360); Blue Mountains, E. Betche, 12.1882 (NSW. 1370); Blackheath, J. Dykes (NSW. 1375); Leura, 12.1910 (NSW. 1374); Katoomba, W. F. Blakely, 11.1932 (NSW. 1366); Mt. Jellore, E. Cheel, 16.11.1912 (NSW. 1364); La Perouse, in swamp, O. D. Evans, 10.1935 (SYD.); Barber's Creek, H. J. Rumsey, 11.1898 (NSW. 1363, 1373); Fitzroy Falls, Nowra, F. A. Rodway, 30.11.1930 (K.); Braidwood, W. Bauerlen, 11.1886 (MEL.); Canberra, R. A. Black, 7.11.1931 (RAB); Albury, E. J. McBarron No. 2677, 28.11.1948 (NSW. 6957).

This species somewhat resembles *D. geniculata,* from which it differs in the hairs on the lemma being mostly in two distinct rows with few short hairs on the back (or on the few specimens seen in which numerous hairs occur also on the back, then the lower hairs are distinctly shorter than the upper series); lateral lobes rather longer awned (the setae 3-4 mm. long instead of 0-2 mm.) and more abruptly narrowed into and differentiated from the setae and rather wider; glumes often a little longer, widest in the lower third rather than about the middle, more acuminate; habit more erect and leaves coarser.

The species may be a useful constituent of natural pastures, but is not known to have any outstanding properties.

11. D. richardsonii Cashmore in Comm. Aust., C.S.I.R., Bull. 69 (1932), Appendix, 2; Trans. & Proc. Roy. Soc. S. Austral., LVII (1933), 72.

Holotypes: *South Australia:* Cultivated in single plant tests in the field, Waite Agricultural Research Institute, Adelaide, seed from plants growing spontaneously at Werribee, Victoria, A. B. Cashmore No. Ga63, 2.12.1932 (ADW; duplicates K; NSW. 4726, 1204). In the original description Cashmore simply cites the locality as Werribee, Victoria, but it is believed that his study was made on cultivated plants derived from that locality. The specimen at the Waite Institute cited above has been labelled Type by Cashmore.

Erect, densely caespitose, sub-glabrous perennial, sometimes sub-glaucous, up to 100 (often about 70) cm. high. Culms moderately stout, 0.75-2.25 mm. diameter, about 3-4-noded, the nodes glabrous, the internodes either shorter or longer than the sheaths. Sheaths glabrous, smooth, striate, clasping the culms or somewhat loose above. Ligule densely ciliate with 0.5 mm. hairs, loosely bearded with hairs up to 5 mm. long at the sides. Blades 10-35 mm. x 1.5-2.5 mm., gradually narrowed into a long acuminate tip, loosely inrolled on drying, glabrous, lightly striate, the lower surface smooth, the upper sometimes slightly and minutely scabrid. Panicle at length much exserted, dense, lanceolate to ovate, 4-10 cm. long, the panicle branches again branched near the base and, together with the short pedicels, scabrous-pubescent. Spikelets usually pale-green to straw-coloured, occasionally lightly tinged with purple, 10-15 (usually about 12) mm long, 4-6- (usually 5-) flowered, the florets closely packed, slightly shorter than the glumes except for the very shortly exserted awns. Glumes with broadly membranous margins, shortly acuminate, smooth, rather broad, broadest about the middle, narrowed above, somewhat cymbiform, divergent but slightly incurved above, subequal or the upper glume slightly exceeding the lower, the lower glume 9-nerved, the upper 7-nerved. Body of the lemma 4-6 mm. long including the 0.5-1 mm. hairy callus, densely villous all over the back above the callus with rather soft hairs about 2.5 mm. long, and with a dense row of 4-5 mm. hairs about 1 mm. below the sinus, pale; lateral lobes about 5-7 mm. long all together, rather broad and flat with membranous margins and often rather scabrid below, narrowed above into fine awns about 1-2 mm. long, or almost unawned; central awn fine, exceeding the lateral lobes by only 2-4 mm., uniform in texture almost to the base without a distinct basal column, reflexed or about once loosely twisted at the base. Palea equalling or very slightly exceeding the sinus, broadly obovate, contracted below, obtuse and often minutely bifid at the apex, pilose on the back in the lower part and between the keels and the margins, minutely ciliolate along the keels almost to the base. Anthers 3, yellow, about 2-2.3 mm. long. Fruit obovate, about 2.5 mm. x 1.5 mm., the embryo about 1.5 mm., convex on the embryo side, very shallowly grooved on the back. Fig. 11.

LOCALITIES: *Queensland:* Marshall, L. Irving, 16.8.1938 (BRI.).

New South Wales: Stannum Road, Deepwater, H. A. Grantham No. 8, 19.5.1941 (NSW. 1514); Guyra district, E. N. McKie No. 2030 (ADW. 377); Bundarra, H. A. Grantham No. 17, 19.5.1941 (NSW. 1498); Wood's Reef, Barraba, H. M. R. Rupp, 12.1913 (NSW. 1496); Bourke, E. Cheel (NSW. 1503); Western Plains, R. C. Buck No. 26, 4.1936 (BRI.); Tilbuster, 5 miles north of Armidale, E. N. McKie No. 2000 (ADW. 376); Armidale district, C. K. Ingram, 12.1938 (NSW. 1487); Armidale, D. O. Cross, 1937 (NSW. 1499); Walcha, H. A. Grantham No. 21, 19.5.1941 (NSW. 1515); Coonabarabran, W. McDonald, 10.1901 (NSW. 1486); Boggabri, R. H. Cambage, 10.1912 (NSW. 1491); Tamworth, 1,900 feet, on gravelly slopes derived from Devonian cherty shales, E. N. McKie No. 2026, 27.10.1931 (ADW. 395); Gulgong, M. V. O'Reilly No. E, 21.11.1939 (NSW 1467); Dubbo, W. F. Blakely, 10.1912 (NSW. 1488); Murrurundi, W. F. Blakely, 10.1911 (NSW. 3642); Molong, W. F. Blakely, 10.1932 (NSW. 1489); Scone, J. Vickery, 29.12.1934 (NSW. 1472); Bathurst Experiment Farm, E. Breakwell, 1919 (NSW. 1495, 1502); Bathurst Experiment Farm, B. L. Ament No. 3, 1.1940 (NSW. 1466); Bathurst Experiment Farm, B. Ament No. 4, 1.1940 (NSW. 1465); 7 miles east of Bathurst, D. L. W. Henderson, 24.5.1945 (NSW. 1499); Bathurst, E. Breakwell, 1.1915 (NSW. 1516); Awaba, J. L. Boorman, 11.1914 (NSW. 1501, 1512); Ashfield (cult. from seeds from Bathurst), E. Cheel, 4.2.1912 (MEL.; NSW. 1504); Ashfield, cult., E. Cheel, 3.1923 (NSW. 1511); beyond the Blue Mountains, Georgina King, 7.1893 (MEL.); Young, A. B. Cashmore, 10.4.1933 (ADW. 393); Goulburn, A. T. R. Brown, 2.1.1937 (NSW. 1508); Duntroon, A. Melvaine, 1940 (CAN.); Wagga Wagga, R. Thom, 1885 (MEL.); Wagga, J. R. Sutherland, 22.11.1936 (NSW. 2253); Walla Walla, R. A. Black, 10.7.1935 (RAB.); Walla Walla Road, Albury, E. J. McBarron No. 1226, 30.10.1947 (NSW. 4589); Tabletop, E. J. McBarron No. 1184, 21.10.1947 (NSW. 4586); Burrumbuttock, E. J. McBarron No. 2737, 3.12.1948 (NSW. 7260); Jindera-Walla Road, E. J. McBarron No. 3229, 8.4.1949 (NSW. 7934); Uranquinty, E. Breakwell (NSW. 1497); Berrigan, Weed Inspector, 30.10.1924 (NSW. 1507); Henty, R. A. Black, 18.10.1933 (RAB); Henty, E. J. McBarron No. 2675, 26.11.1948 (NSW. 6958).

Victoria: Springhurst, R. A. Black, 11.7.1935 (RAB).

South Australia: Waite Agricultural Research Institute, H. C. Trumble, 1930 (MEL.); Waite Agricultural Research Institute, No. 1, J. M. Black, 1.1932 (MEL.); Netherby, F. R. Hilton, 19.9.1944 (RAB).

Bentham identified a specimen of *D. richardsonii,* viz., "Liverpool Plains, rec'd. Chas. Moore, 9/74, No. 115" as *D. pallida,* but did not specifically cite it in the Flora Australiensis.

D. richardsonii is probably one of the most potentially useful species as a fodder grass. It produces large leafy tufts which are readily consumed by stock. However, it does not seem to be very abundant in many natural pastures at the present time.

12. **D. linkii** Kunth, Enum. Pl., I (1833), 315. (The figure in Agric. Gaz. N.S.W., II (1891), 174, t. xxii sub *D. pallida* probably represents this species.)

TYPIFICATION: Based on *Avena bipartita* Link, Hort. Reg. Bot. Berol., I (1827), 113. This was described from a specimen which was probably cultivated in the Berlin gardens, and was believed by Link to have been derived from Australia. The Holotype specimen was preserved in the Berlin Herbarium, but I have no information as to whether it is still extant. It bore the following data: "*Avena bipartita*, Nov. Holl. (Link). Link Hort. i, 113. Hort.

Bot. Berol. *Danthonia Linkii* Kunth. Agr. p. 315, n. 23." I have seen a fragment from the Holotype which enabled me to recognise it as identical with a species which is common in parts of New South Wales and southern Queensland, and which is represented by the collections enumerated below.

A somewhat variable, erect, densely caespitose, very leafy, subglabrous perennial, up to 70 cm. high. Culms smooth, about 4-noded, usually about 1 mm. diameter, the internodes at length exceeding the usually smooth sheaths. Ligule shortly ciliate, without or with very few long hairs at the sides. Blades firm, often rather long, e.g., 20-30 cm., rather flat to loosely involute, 1-2.5 mm. broad, or sometimes closely involute and almost subulate, subglabrous or rarely sparsely hirsute. Panicles with numerous spikelets or sometimes reduced to few, somewhat spreading or contracted, at length much exserted but sometimes not greatly exceeding the leaves, lanceolate to ovate in outline, sometimes linear-lanceolate, 4-12 (usually 6-7) cm. long, the panicle branches up to 4 cm. long, finely scabrous to scabrous-pubescent. Spikelets typically pale-greenish to straw-coloured, occasionally slightly tinged with purple towards the tips of the glumes, about 6-flowered, the florets slightly shorter than the glumes except for the shortly exserted awns, crowded. Glumes subequal or the upper slightly exceeding the lower, usually 8-13 mm. long (up to 17 mm. in some forms), shallowly boat-shaped in outline, broadest about the middle and below, narrowed in the upper third into acuminate, almost awn-like points, often slightly swollen below and incurved above the middle, the lower glume slightly keeled above, firm and with firmly membranous margins at length rolling inwards so that they appear narrow, smooth or minutely scaberulous on the mid-vein. Lemma always pale-coloured, sometimes striate, lanceolate in outline, the body 3-3.5 mm. long including the 1 mm. densely hairy callus, not shining, covered uniformly all over the back with short hairs which grade into an upper row of fine hairs up to 5 mm. in length just below the sinus; lateral lobes about 7-8 mm. long in all, the lower part striate with narrow membranous margins tapering very gradually into short, 2-3 mm. awns, microscaberulous; central awn about 7-11 mm. long, scarcely or shortly exceeding the lateral lobes, usually very shortly exceeding the glumes, pale and of more or less similar texture throughout, straight at first, at length sharply reflexed above the sinus but not or scarcely twisted or rarely once or twice twisted over a distance of 1-1.5 mm. at maturity, but not or scarcely brown at the base in the typical form. Palea exceeding the sinus, about 4.5 mm. long, lanceolate-elliptical, narrowed acutely in the upper part, with a very narrowly truncate or minutely bifid apex, minutely ciliolate on the keels at least near the middle, rather densely hirsute on the back and between the keels and margins in the lower part. Anthers pale-yellow to orange, about 1-2 mm. long. Seed obovate, about 1.75 mm. long. Fig. 12.

LOCALITIES: *Queensland:* Kingaroy to Bell, G.B. Vickery, 8.7.1936 (NSW. 1545); Cooranga North via Bell, V. R. Cumming No. 4, 5.2.1937 (MEL.; BRI.); Chesterton Station, Warrego district, S. T. Blake No. 11100, 7.4.1936 (BRI.; NSW. 3343; MEL.); Brisbane River, F. M. Bailey, 3.1873 (MEL.); Darling Downs, on black soil, R. Roe, 2.1939 (CAN.); Darling Downs, Tummaville, C. T. White No. 12588, 19.1.1944 (BRI.); Moonie River, R. Roe, 20.2.1937 (NSW. 2536); Palardo, W of Miles, S. T. Blake No. 5848, 9.5.1934 (BRI.; NSW. 2534); Toowoomba, about 2,000 feet, S. T. Blake No. 5156, 12.2.1934 (BRI.; K.; NSW. 1650; MEL.); and No. 5157 (K.), and No. 5158 (K.); Darling Downs district, West Toowoomba, D. A. Goy, 3.4.1940 (BRI.); Near Allora, Darling Downs, S. T. Blake No. 293, 25.6.1932 (K.); Toowoomba, N. A. R. Pollock, 3.2.1928 (BRI.), and 1.1936 (MEL.); Swanfels, Darling Downs, N. A. R. Pollock, 1.1935 (K.); Darling Downs, between Inglewood and Milmerran, C. T. White No. 9781A, 20.1.1934 (BRI.), and No. 10390, 24.4.1936 (MEL.); Chinchilla, R. C. Beasley No. 158, 4.1931 (BRI.; K.); Canning River, Warwick, J. H. S. Barnes, 12.1933 (BRI.; MEL.; K.); Warwick (MEL.); Hannaford, Tara district, C. T. White, 8.2.1938 (BRI.); between Miles and Drillham, S. T. Blake No. 7698, 19.2.1935 (BRI.; NSW. 1644); Kindon Station, 54 miles NNE of Goondiwindi, L. S. Smith No. 520, 5.12.1938 (BRI.), and No. 561, 6.12.1938 (K.); Goondiwindi, S. T. Blake No. 10503, 25.2.1936 (BRI.; NSW. 1642; MEL.); Morven, about 1,400 feet, S. T. Blake No. 10903, 30.3.1936 (BRI.; NSW. 1649; MEL.); Botanic Gardens, Brisbane, C. T. White No. 9781, 20.1.1934 (K.).

New South Wales: New England, R. McFarland, 1890 (MEL.); Deepwater, H. H. Grantham No. 7, 19.5.1941 (NSW. 1656); Glencoe, H. H. Grantham No. 1, 4.1940 (NSW. 1535); Glen Innes Experiment Farm, E. Breakwell, 17.6.1941 (NSW. 1540); Glen Innes, J. Vickery, 30.12.1934 (NSW. 1456); 4 miles NW of Glen Innes, 3.400 feet, E. N. McKie No. 2013, 8.12.1932 (ENM.); Glen Innes, E. Cheel, 8.12.1924 (NSW. 1563); Ben Lomond, H. H. Grantham No. 3, 5.1940 (NSW. 1536); Stonehenge, H. H. Grantham No. 2, 4.1940 (NSW. 1646) and No. 6B, 5.1940 (NSW. 1537); Macleay River, Beckler (K.); Gravesend, E. Breakwell, 4.1913 (NSW. 1543); Warialda, J. Vickery, 1.1932 (NSW. 1531); Moree, W. M. Carne, 5.1914 (NSW. 1566); Inverell, E. Thomas, 8.1912 (NSW. 1653); Moredun Creek bridge, Guyra to Inverell road, about 3,500 feet, E. N. McKie No. 2004, 2.1.1932 (ADW.); Kelso, 30 miles NW of Guyra, E. N. McKie No. 363, 4.4.1930 (NSW. 1641), and 27.3.1947 (NSW. 3185); Bald Blair, Guyra, H. H. Grantham No. 16, 19.5.1941 (NSW. 1655); Guyra, at 4,330 feet, E. N. McKie No. 2005, 8.12.1931 (ENN.); Georges Creek, 14 miles from Guyra, E. N. McKie No. 2025, 11.12.1932 (ADW. 396); 15 miles NW of Guyra, E. N. McKie, 12.5.1928 (RAB.); Guyra, 4,300 feet, on red basaltic soil, E. N. McKie No. 2452, 28.3.1946 (NSW. 2547); Guyra, E. N. McKie, 3.4.1947 (NSW. 3184); Armidale, R. Roe, 22.2.1945 (CAN.); Woodville, E. N. McKie No. 2353, 25.11.1942 (NSW. 1519); Plains near Baradine, W. Forsyth, 10.1899 (NSW. 1549); Coonamble, E. Breakwell (NSW. 1561); Merriwa, E. Cheel. 14.3.1924 (NSW. 1552, 1560); Trangie, R. J. Hutchinga, 3.1947 (CAN.); Nevertire, R. Helms, 11.1892 (NSW. 1530; SYD.); Warren to Collie road, J. Vickery, 15.1.1936 (NSW. 1534); Dubbo, W. F. Blakely, 10.1912 (NSW. 1568); Namoi River, A. & D. Carson, 3.1887 (MEL.); Tamworth, E. N. McKie No. 2484, 21.5.1931 (NSW. 3230); Kars Springs, Scone, T. G. B. Osborn, 23.1.1934 (SYD.); Orange, J. B. Cleland, 10.1914 (NSW. 1564); Singleton, J. L. Boorman, 11.1914 (NSW. 1527, 1558; K.); Kurrajong, Woolls (MEL.); Port Jackson, C. Gaudichaud (PARIS MUS. HERB.); Wentworthville, K. Mair, 20.1.1950 (NSW. 10621): Castlereagh, Woolls (MEL.); Southern Highlands, exhibited at the Franco-British Exhibition of 1914 by the Director of Sydney Botanic Gardens under the name of *D. pallida* (K.); Dangars Plains, Leichhardt (MEL.); Oomah via Grenfell, E. Breakwell (NSW. 1645); Wagga Experiment Farm, J. N. Whittet, 11.1921 (NSW. 1532).

Victoria: Eldorado, R. A. Black, 11.11.1934 (RAB); Port Phillip, F. Mueller, 1.1884 (MEL.); Ardmona, R. A. Black, 16.11.1934 (RAB); Daylesford, R. Wallace, 1878 (MEL.); Grampians, C. Walters, 12.1887 (NSW. 1547); Wimmera, J. P. Eckert, 1890 (MEL.), and 1892 (MEL.).

D. pallida var. *subracemosa* Benth., Fl. Austral., VII (1878), 593 is in part *D. linkii*. Bentham cites two specimens, Warwick and Macleay Rivers, Beckler. The specimen from Macleay River at Kew is *D. linkii*. That from Warwick is distinct, with the hairs on the lemma in two separate series, and is probably *D. purpurascens*. (See also note under *D. pallida.*)

D. semiannularis var. *browniana* Domin in Biblioth. Bot., LXXXV (1915), 363 is also *D. linkii* in part. The Type collection from the Blue Mountains, N.S.W. in Domin's herbarium consists partly of *D. linkii* and partly of *D. purpurascens*.

Bentham, in the Flora Australiensis, suggested that *D. linkii* might be referable to *D. semiannularis*. This has not proved correct.

D. linkii resembles *D. richardsonii* in many respects, but can be readily distinguished by the long acute palea. Usually also the glumes and florets are rather smaller than those of *D. richardsonii*, and the plant rather more slender.

The species is of considerable economic importance as a valuable constituent of natural pastures in extensive areas in New South Wales, especially in the north, where it is most abundant on black soils.

12a. Var. **fulva** J. Vickery in Contrib. N.S.W. Nat. Herb., I, No. 5 (1950), 299.

HOLOTYPE: *New South Wales:* Flemington, G. B. Vickery, 31.3.1929 (NSW. 1573).

Awn brown and twisted at the base for 3-4 mm. Lateral setae and central awn often rather longer than in the typical form. Glumes 12-17 mm. long, the panicle often elongated and loose, sometimes sparse and almost linear. Plant often more robust with broader leaves.

LOCALITIES: *New South Wales:* Dubbo, W. F. Blakely No. 78, 10.1912 (NSW. 1583), and No. 80 (NSW. 1582); Bowan Park, W. F. Blakely, 11.1907 (NSW. 1593); Rylstone, D. O. Cross, 7.3.1941 (NSW. 1594); Parramatta River, J. L. Boorman, 11.1914 (NSW. 1588); Mt. Wilson, J. Gregson, 1.1902 (NSW. 1591); Young, E. Cheel, 11.11.1925 (NSW. 1590); Woomargama, E. J. McBarron, 10.4.1947 (NSW. 3228); Mountain Creek-Holbrook, E. J. McBarron, 29.4.1946 (NSW. 3229); Table Top, E. J. McBarron No. 3159, 19.3.1949 (NSW. 7672); Yanco, E. Breakwell, 11.1913 (NSW. 1584, 1586, 1592), and 7.1919 (NSW. 1585); Wagga Wagga, R. Helms, 6.1900 (NSW. 1581); Wagga Wagga, E. Breakwell (NSW. 1576); Wagga Wagga, R. Thom, 1885 (MEL.).

Victoria: Dookie Agricultural College, cult., 1909 (MEL.); Warrenbayne, R. A. Black, 9.11.1935 (RAB); Ardmona, G. Robinson, 26.9.1899 (MEL.); Tatura, R. A. Black, 8.12.1933 (RAB.; MEL.); Tubb's Hill, Longwood, R. A. Black, 25.11.1935 (RAB); Avenal, R. A. Black, 22.11.1932 (RAB); Castlemaine, A. J. Tadgell, 10.1932 (MEL.); Dandenong Ranges (MEL.); Drysdale, F. Mueller, 12.1883 (MEL.); Broadmeadows, about 9 miles NNW of Melbourne, L. S. Smith No. M19, 21.3.1943 (BRI.); Shire of Dimboola, F. M. Reader, 14.12.1899 (MEL.).

South Australia: Adelaide, cult. at Waite Agricultural Institute, No. Ga129, H. C. Trumble, 1930 (K.).

Although obviously more closely related to normal *D. linkii,* this variety seems to provide a link between *D. linkii* and *D. induta.*

13. **D. induta** J. Vickery in Contrib. N.S.W. Nat. Herb., I, No. 5 (1950), 298.

HOLOTYPE: *New South Wales:* Armidale, C. K. Ingram, 12.1938 (NSW. 1344).

Rather tall, robust, caespitose perennial, 75-120 cm. high. Culms smooth, sometimes somewhat compressible, sometimes 2.5-3.5 mm. in diameter, about 4-noded, the internodes usually much exceeding the leaves. Sheaths glabrous. Ligule consisting of short, dense cilia, often with a few longer hairs at the sides. Blades glabrous, flat to loosely inrolled, 1.5-4 mm. broad, up to 30 cm. long, narrowing into a fine subulate point, firm. Panicle much exserted, loosely spreading or more or less linear-lanceolate when dry, 9-18 cm. long, bearing many spikelets, the panicle branches scaberulous. Spikelets mostly 3-flowered, the florets distinctly shorter than the glumes, rather distantly placed. Glumes straw-coloured, usually tinged with purple and green, broadest near the base, narrowed into rather long, acuminate points, subequal or irregularly unequal, 14-18 mm. long, about 5-7-nerved, with distinct membranous margins. Body of the lemma 4.5-5.5 mm. long including the 1-2 mm. long callus, pale coloured, distinctly veined, covered with scattered hairs which are densest at the base and in a transverse row just below the sinus, the lower hairs up to 2 mm. long, the upper series of hairs about 4-5 mm. long; lateral lobes narrow, diminishing evenly into the setae, 7-9 mm. long including the 1-3 mm. fine setae; central awn much exceeding the lateral lobes, about 13-18 mm. long, shortly but distinctly exceeding the glumes, early becoming distinctly brown and twisted in the lower part for a distance of 4-6 mm. Palea about 6-8 mm. long, much exceeding the sinus (by nearly 4 mm.), very narrow lanceolate, acuminately narrowed, hirsute on the back and between the keels and margins in the lower part, thinly membranous above. Anthers orange-coloured, 2-3 mm. long. Fig. 13.

LOCALITIES: *Queensland:* Canungra, Moreton district, S. T. Blake No. 12876, 26.3.1937 (BRI.; NSW. 1348; MEL.); Mt. Mee near Daybore, Moreton district, S. T. Blake No. 13862, 5.11.1938 (BRI.; NSW. 3465; MEL.); Kilburnie, on the Woolbrook-Campfire road, 4,000 feet, F. M. Bailey, 24.1.1935 (MEL).

New South Wales: Guyra-Tingha road, 7 miles NW of Guyra, E. N. McKie No. 2024, 31.12.1933 (NSW. 1349; ADW. 418); Guyra-Booralong road, E. N. McKie No. 2483, 28.12.1933 (NSW. 3231); Oban, 17 miles NE of Guyra, 4,000 feet, E. N. McKie No. 636, 18.12.1930 (BRI.; K.); Black Gully, 7 miles NW of Guyra, about 4,000 feet, on white, sandy soil, E. N. McKie No. 2008, 11.1.1932 (NSW. 1350; ADW. 417); Guyra-Tingha road, E. N. McKie No. 637, 28.12.1930 (BRI.; K.); Walcha road, J. L. Boorman, 12.1912 (NSW. 1347, 3925); Katoomba, about 3,000 feet, S. T. Blake No. 13904, 21.1.1939 (BRI.).

Victoria: E. Gippsland, W. Hunter, 26.9.1939 (MEL.); Ballarat, W. Burbidge, 1878 (MEL.); Mt. Rosea track, Grampians, alt. 2,500 feet, E. L. Robertson, 16.2.1952 (ADW. 6849).

D. induta differs from *D. richardsonii* in the long, acute palea. It differs from both *D. richardsonii* and *D. linkii* in the following characters: Spikelets usually only 3-4-flowered, the florets not crowded; central awn brown and twisted at the base for 4-6 mm., much longer than the lateral lobes; generally a tall robust grass with wider, sparsely hirsute leaves; panicle more elongated, loose; florets rather longer but the lateral lobes relatively rather shorter; palea longer; anthers up to 3 mm. long, orange-yellow.

This species, though probably useful in the localities in which it occurs, has not attracted any particular attention as an economic grass.

14. **D. occidentalis** J. Vickery in Contrib. N.S.W. Nat. Herb., I, No. 5 (1950), 300.

Holotype: *Western Australia:* Karrakatta (Perth district), ex herb. W. V. Fitzgerald, 11.1900 (NSW. 4389; duplicate K.).

Erect, caespitose perennial, 25-60 cm. high, often inhabiting sandy soils. Culms rather slender, smooth, lightly striate, glabrous except pubescent to pilose just below the panicle, 3-4-noded, the internodes often much exceeding the sheaths, the nodes glabrous. Sheaths striate, smooth. Ligule rather conspicuously long-ciliate. Blades inrolled, subglabrous or lightly to densely hirsute, 5-30 cm. long, moderately fine, striate. Panicle usually much exserted, contracted, rather dense, lanceolate to broad lanceolate, greenish or purplish, the rhachis and pedicels pilose-pubescent, usually with a small tuft of hairs below each spikelet. Spikelets about 3-4-flowered, the florets loose, about half as long as the glumes except for the exserted awns. Glumes subequal or the lower glume a little longer than the upper, 16-22 mm. long, very narrow, with narrow membranous margins, acuminate into awn-like points, broadest in the lower quarter, divergent, mostly 5-7-nerved at the base. Lemma narrow, linear, with a rather long (about 1.5 mm.) pointed, narrow, pilose callus, the body about 4-4.5 mm. long including the callus, more or less uniformly pilose on the back with short (0.5 mm.) hairs, and with a band of long hairs (3-4 mm.) placed just below the sinus; lateral lobes narrow, about 7-10 mm. long, flat and membranous at the base, narrowed into fine setae about as long as the flattened portion; central awn golden and twisted at the base for 4-6 mm., dark and reflexed above, about 12-17 mm. long in all, much exceeding the lateral lobes. Palea narrow lanceolate, much exceeding the sinus, narrowly truncate or bifid, minutely ciliolate on the margins above the middle, subglabrous or pilose on the back and with a few scattered hairs between the keels and margins. Caryopsis oblong, about 2 mm. x 0.6 mm. Fig. 14.

Localities: *Western Australia:* Bow River, S. W. Jackson, 11.1912 (NSW. 4395); between Irwin's Inlet and Brooke's Inlet, S. W. Jackson, between 10.1912 and 2.1913 (NSW. 4403); Leederville, ex herb. W. V. Fitzgerald, 11.1901 (NSW. 4392); Crowley, on sand, P. Roe, 16.10.1934 (CAN.); Perth, J. H. Maiden, 10.1909 (NSW. 4393); Preiss, 1838 (MEL.); Claremont, near Perth, C. Andrews, 1st Coll., No. 1211, 8.10.1902 (K.), and No. 1212, 14.10.1902 (K.); between Bayswater and Perth, A. Morrison, 20.10.1901 (K.); Perth, King's Park, A. Morrison, 31.10.1908 (K.); Subiaco, lower Swan River, A. Morrison, 4.11.1898 (K.); Swan River, Drummond, 1839 (CGE); Karrakatta, ex herb. W. V. Fitzgerald, 11.1900 (NSW. 4390); Bassendean, C. B. Palmer, Nos. 10, 11, 1930 (BRI.; K.); Pinjara, R. Helms, 27.9.1897 (PERTH); Brunswick, F. Stoward, 11.1911 (NSW. 4391); Banks of the Blackwood, Oldfield (MEL. 650 in part); Kalgan, Oldfield (MEL. 649); A. G. Hamilton, 1902 (NSW. 4394).

A few specimens of this species in the herbarium of the Royal Botanic Gardens, Kew, were variously referred to *D. semiannularis* and *D. setacea* by Bentham.

Superficially this species much resembles *D. acerosa,* but may be distinguished by its uniformly pilose lemma.

15. D. semiannularis (Labill.) R.Br., Prod. (1810), 177.

SYNONYMS: *Arundo semiannularis* Labill., Pl. Nov. Holl., I (1804), 26. t.33; *Danthonia penicillata* F. Muell., Fragm. Phyt. Austral., VIII (1873), 134, partim, non Beauv., (1812), (non *Arundo penicillata* Labill.); *D. penicillata* var. *semiannularis* Maiden et Betche, Census of N.S.W. Pl. (1916), 22 (incorrectly ascribed there to F. Muell.).

TYPIFICATION: Much confusion has existed concerning the identity of *D. semiannularis*, and its typification has proved a matter of some complexity. My investigations have led me to a conclusion which differs from that of most botanists since the time of Labillardière, and it therefore seems desirable to state in full the processes by which I have reached this conclusion.

The figure of *Arundo semiannularis* in Labillardière's Pl. Nov. Holl. shows a specimen with the lemma (1) more or less uniformly villous on the back with short hairs, (2) with one row of much longer hairs below the sinus, (3) with short unawned lateral lobes (4) not or scarcely exceeding the long hairs, (5) the central awn very much longer than the lateral lobes and (6) very slightly exceeding the glumes, (7) the glumes narrow, incurved, finely acuminate, (8) the sheath pilose at the orifice, (9) the culm about 3-noded, (10) the leaves not particularly flexuose or unusually long

Labillardière's description substantially confirms these features, but the following points should be noted. (1) The plant as drawn is almost 30 inches long. The description states that the plant is 18 inches high, so that it must be assumed that the habit study is enlarged a little more than 1½ times. Thus the specimen figured would have a smaller spikelet than might be assumed from a first impression of the figure. (2) In the description it is stated that the lemma is "villous, semiannulate above (and also in the middle) with long hairs". But a specimen is figured which is villous but with *only one row of long hairs*.

Many collections of *Danthonia* examined by me have been found to consist of two or more species, the collectors having evidently placed them together under the impression that they had only the one species. It occurred to me that Labillardière may also have had before him more than one species, and that one of these formed the basis of his figure and primarily of his description, but that the words in parentheses in the phrase "villous above (and also in the middle) with long hairs" may have been inspired by examination of a different species with hairs arranged in an upper and lower row.

To test this possibility a search was made for a species occurring in Tasmania which would agree well in its characteristics with Labillardière's figure. This search was successful, and the specimens enumerated below are considered to show substantial agreement with Labillardière's somewhat conventionalised illustration.

The attempt was then made to trace the whereabouts of Labillardière's collections. In a letter to Sir Joseph Hooker written during 1834, preserved in correspondence at the Royal Botanic Gardens, Kew (letter No. 238), P. B. Webb refers to the fact that he has come into possession of the Herbarium of Labillardière, Desfontaines and others. In a later letter (No. 241) of 13.1.1835, Webb writes: "I am occupied in separating for you from the herbarium of Labillardière as rich a series as I can make up. You will have the best set after the Museum and Baron Delessert, who have already helped themselves. The collection being essentially French and made at the expense of their government I felt myself bound to present all the duplicates I could spare to those two great national establishments. . . . Tho' you are I am convinced exceedingly rich in Australian vegetation, I am in hopes that Labillardière's specimens will interest you as types of the species he describes." Again in March, 1835, (letter No. 242), Webb writes " . . . You will find in the box about 300 specimens principally from the herbarium of Labillardière. I thought it more interesting to give his names as I find them and to leave the rest without names". The last two letters were written from Paris, and the Museum to which he refers is the Paris Museum of Natural History. Delessert's herbarium was ultimately presented to the Conservatoire et Jardin Botanique, Geneva. Webb's own herbarium, presumably containing the best set of Labillardière's plants is at the Botanical Institute of the University of Florence. Specimens at Kew received from Webb were written up simply as "Webb", together with such earlier name and locality label as may have been previously attached to them.

There is at Kew a specimen of *Danthonia* on a sheet written up as "Webb" and bearing a label which can be recognised as similar to those found on other sheets known to have formed part of Labillardière's collections. In this case the label reads "*Avena quadriseta.* N. Holl." This name has obviously been applied in error doubtless as a result of confusion with another of Labillardière's specimens. There seems no doubt, however, that this specimen was a part of Labillardière's collection. This specimen consists of two culms only, from which the majority of the florets have dropped. There are some three or four intact spikelets, and a number of lemmas in an attached capsule. These agree admirably with Labillardière's figure of *Arundo semiannularis* in respect of all the points analysed above, notably in the lemma being uniformly villous in the lower part, the uppermost series of hairs much longer, the lateral lobes short and not exceeding the upper series of hairs. I consider that, in spite of the incorrect name which its label bears, this specimen has very strong claims to be regarded as a part of the Type collection of *Arundo semiannularis.*

In the herbarium of the Paris Museum of Natural History there is a specimen which was at one time regarded as part of the Type of *Arundo semiannularis.* This sheet bears the following information written by four different hands, of which it was not possible to determine the oldest: "*Arundo semiannularis.* Bill. T33./ *Danthonia semiannularis* Brow./ N. Holl. d'etr. d'Entrecasteau./ Guichenot." The specimen belongs to a species of *Danthonia* in which the hairs on the lemma are predominantly restricted to two rows and imperfectly glabrous between the rows. It is quite distinct from the species represented by the specimen at Kew discussed above, and does not agree with Labillardière's figure. The data on the label is seen to offer two contradictory indications as to the collector, and various possibilities suggest themselves. "Bill. T33" is obviously a reference to Labillardière, and Labillardière was on Entrecasteau's voyage. Guichenot was a gardener who accompanied Leschenault's expedition captained by Baudin. He brought back dried specimens, seeds and living plants from various parts of Australia, Timor and the Cape of Good Hope. Some of the seeds were grown and it is possible that this plant was grown in Europe from such seed, as its appearance somewhat suggests, or from seed brought back by Labillardière. In view of these uncertainties and of its lack of agreement with Labillardière's figure, I do not consider that this specimen has any claim to be regarded as the Type of *Arundo semiannularis.*

Dr. Pichi-Sermolli has kindly searched the herbarium at Florence for any of Labillardière's specimens which could be the Type of *Arundo semiannularis.* Two sheets are worthy of consideration, one of which I was able to examine, while Dr. Pichi-Sermolli has forwarded a photograph of the other and lent me a spikelet for examination. The first was for some time regarded as the Type at Florence. It bears two specimens and three labels. One of the specimens (that on the right-hand side of the sheet) agrees with the specimen at Kew already discussed. It bears a label inscribed "*Arundo semiannularis* bill. variat". Unfortunately the writing is not that of Labillardière, and there is nothing to prove that it is part of the Type collection, though its striking resemblance to the specimen at Kew does suggest that it might have been. A second label reads "Herb. Webbianum. *Danthonia semiannularis* R.Br. Ex Herb. Desfontaines". This label is so situated that it might pertain to either of the two specimens mounted on the sheet. As noted above Webb acquired both Desfontaine's and Labillardière's collections, but I cannot establish any other connection between Labillardière and Desfontaine. The specimen on the left-hand side of the sheet with its attached label does not otherwise affect the present investigation.

The second sheet at Florence, of which I have examined a photograph, bears a label on which is printed "Herb. Webbianum. Ex. Herb. Labillardière", and in handwriting the words "Novae Hollandia et Terra Diemen". Attached to the herbarium sheet are other sheets bearing descriptive notes which according to Dr. Pichi-Sermolli are in the handwriting of Labillardière. The notes are headed "*Arundo semiannularis.* tab.33". The herbarium sheet also bears the small printed label "Tipo". The specimen bears several culms and is complete with rootstock. The general appearance of the plant suggests and examination of the spikelet available to me confirms that the species represented is one in which the lemma bears two rows of long hairs and only a few sparse hairs between the rows. In my opinion it does not agree with Labillardière's figure of *Arundo semiannularis.* Labillardière's descriptive notes on the sheet are not identical with the published description though they do bear some resemblance to it.

I have not had the opportunity of examining any specimens of *Danthonia semiannularis* that may be in the herbarium of Geneva.

Of the four specimens located which have been variously regarded as the Type of *Arundo semiannularis,* therefore, only two can be established beyond doubt as having formed part of Labillardière's collections, namely that at Kew and the second specimen discussed from Florence. The two are not conspecific, so that it is evident that Labillardière had two distinct species in his collection, was presumably unaware of the fact, and may well have derived his description from a study of both of them, but only one of them was illustrated. In the separation of duplicates the two species have evidently been distributed under the one name. It is necessary therefore to choose one of them as typifying the species. The Florence specimen has strong claims to be regarded as the holotype as it bears Labbillardière's notes and the name *Arundo semiannularis* written by him, but whether the notes were attached to the sheet by Labillardière or at some later date cannot be established. Moreover, it does not agree with Labillardière's illustration. The Kew specimen does agree with the illustration and on the whole is more aptly characterised by Labillardière's description. However, it was apparently distributed under a false name. Nevertheless, it seems to be the most reasonable choice of the two to typify the name *Arundo semiannularis*, and I now designate it as the Lectotype.

I regard the second specimen discussed from Florence and the specimen at Paris as representing forms of *D. caespitosa* Gaud. The first specimen discussed from Florence is *D. semiannularis.*

When R. Brown transferred *Arundo semiannularis* to the genus *Danthonia* he also supplied a short description which has probably served as the basis for the popular conception of the species for the last century. He did not refer to the lemma as villous, but stated that it is bearded at the base and middle. The proportions he gives between the lengths of the upper series of hairs, the lateral lobes and the central awn of the lemma do not agree with those figured by Labillardière. It seems very probable that Brown never saw the actual specimen which served as the basis of Labillardière's description and figure. Examination of Brown's specimen (No. 6233) at the British Museum of Natural History shows it to consist of two species, one of which is *D. setacea*, while the other appears to be referable to a form of *D. purpurascens*, and distinct from either of the species collected by Labillardière, but of the two more closely resembling that now referred to *D. caespitosa.*

Trinius (Species Graminum, 1836, t. 58) illustrates under *D. semiannularis* a plant similar to one of those collected by Brown, viz., a form of *D. purpurascens.*

Erect, caespitose, subglabrous perennial, about 20-45 cm. high. Culms slender, much exceeding the leaves, smooth, about 3-noded, the nodes glabrous, the internodes longer than the sheaths. Sheaths mostly closely enfolding the culms, or sometimes the lower sheaths somewhat loose, glabrous, more or less smooth. Ligule a rather dense ring of short (0.5 mm. long) hairs. Blades involute, rather narrow, or occasionally slightly flattened, the culm leaves short, the lower leaves up to 15 cm., rarely more, glabrous, rather firm, not flexuose, fairly smooth on the outer surface, finely striate. Panicles much exserted, contracted, usually narrow lanceolate, 5-8 cm. long, the branches rather short and more or less erect, and, together with the pedicels, scabrous to scabrous-pubescent. Spikelets greenish and purplish or at length purplish straw-coloured, the florets about two-thirds to three-quarters as long as the glumes except for the barely exserted awns, not very closely packed. Glumes narrow, narrowly acuminate, divergent, often slightly incurved above, about 7-11 mm. long, subequal, the lower sub-7-nerved, the upper 5-nerved, firm, the firmly membranous margins distinct. Lemma lanceolate in outline, the body about 2-2.5 mm. long including the short hairy callus, 9-nerved, not shining, pale-coloured, uniformly though sometimes rather sparsely villous with short 0.5 mm. hairs, and with a row of longer hairs (up to 4 mm.) just below the sinus; lateral lobes not or very shortly exceeding the hairs, narrow, thin, tapering into fine points, unawned or the setae barely exceeding 1 mm. in length and capillary; central awn distinctly brown and twisted for 2-3 mm. at the base, often also purplish tinted in the upper part, about 9 mm. long altogether, more than twice as long as the lateral lobes. Palea shortly or distinctly exceeding the sinus, about 2.5-3.5 mm. long, lanceolate to oblong, very minutely ciliolate on the keels in the upper part, with a very few scattered hairs on the back in the lower part and near the margins, the marginal region very narrow, narrowing at the apex into a membranous erose tip. Anthers yellow, about 1 mm. long. Fruit about 1.5 mm. long, obovate. Fig. 15.

LOCALITIES: *New South Wales:* Hornsby, W. F. Blakely, 10.1914 (NSW. 4359); Concord West, O. D. Evans, 11.1925 (SYD.); Homebush, J. Vickery, 20.10.1929 (NSW. 4368), and No. H.73, 4.1931 (K.); Homebush, J. Vickery, 12.10.1930 (NSW. 4374; SYD.); Rookwood, E. Cheel, 4.11.1918 (NSW. 4366, 4375); Lakemba, E. Bennett, 6.11.1939 (NSW. 4360); Kogarah, J. H. Camfield, 10.11.1902 (NSW. 4361); Kogarah Bay, E. Cheel, 11.1899 (NSW. 4376).

Victoria: Near Orbost, on coastal sand dunes, N. A. Wakefield No. 2200, ca. 1947 (NSW. 4935); Boronia, A. J. Tadgell, 3.1931 (MEL.); Yarra Junction, A. J. Tadgell, 12.1936 (MEL.).

Tasmania: Van Diemen's Land, ex herb. Lehmann, from Lindley, Nos. 7 and 24, 1849 (CGE.); without exact locality, L. Rodway (HO.); R. C. Gunn (CGE.); Blackman Bay, L. Rodway, 1.1928 (HO.); Flinder's Island, Strzelecki Peak, J. B. Cleland, 25.11.1912 (NSW. 802); Blackman's Bay, O. Rodway, 12.1928 (HO.); New Norfolk, Gunn, No. 1457, 15.11.1840 (K.); Hobart, L. Rodway, 1.1930 (HO.); Smithton, 100 feet, D. Martin, 12.1937 (NSW. 805); Penquite, Gunn No. 1454 in part, 13.11.1841 (NSW. 4741); Lunawanna, Sth. Bruny Is., R.A. Black, 7.2.1948 (RAB.; NSW. 10788); Shipwrights Point, S. Huon, on rich soil, Oldfield No. 121 (K.); North of Eaglehawk Neck, J. Vickery, 15.1.1949 (NSW. 7472); Blowhole, Eaglehawk Neck, J. Vickery, 15.1.1949 (NSW. 7464); Copping, J. Vickery, 15.1.1949 (NSW. 7475); Eaglehawk Neck, J. Vickery, 15.1.1949 (NSW. 7473); near Hastings, N. T. Burbidge, 15.1.1949 (CAN. 3174).

South Australia: Bach Vally, Encounter Bay, in swampy soil, J. B. Cleland, 28.10.1934 (JBC.; NSW. 3617); Dismal Swamp to Mt. Gambier, R. Alcock, 1.1.1941 (ADW. 4542).

Also found in New Zealand, where it is thought to have been introduced from Australia. Titirangi, near Auckland, V. D. Zotov No. 6533, 10.12.1932.

The New South Wales specimens of *D. semiannularis* are a less perfect match for the Type than those collected in Tasmania as might perhaps be expected from their geographic isolation. The lateral lobes tend to be slightly longer with better defined though short awns, and the hairs on the body of the lemma tend to be more sparse and more concentrated towards the base. The tendencies are slight, however, and insufficient to consider them as other than conspecific.

In floral characters this species closely resembles *D. longifolia* R.Br. of the mainland, especially those forms which have the rather longer lateral lobes, but most Tasmanian specimens have the short lobes seen in the Type and illustrated by Labillardière. All differ from *D. longifolia* in the 3-noded culms, not wiry at the base, and without the very long, flexuose leaves.

Bentham's description of *D. semiannularis* in the Flora Australiensis applies to species allied to *D. caespitosa* rather than to the true *D. semiannularis* as typified above. Examination of the specimens cited by him and of others named by him as *D. semiannularis* showed that they included *D. caespitosa, D. purpurascens, D. pallida, D. duttoniana, D. alpicola, D. setacea, D. laevis, D. semiannularis, D. acerosa* and *D. occidentalis.*

D. semiannularis appears to be a fairly common species in Tasmania and is probably of some importance in pastures in some parts of the island. On the mainland it does not appear to be sufficiently abundant to be of any particular economic importance.

15a. Var. **gracilis** (Hook. f.), Hook. f., Handb. New Zeal. Fl. (1867), 333.

TYPE: *New Zealand: Middle Island:* Aglionby Plains and Motucka Valley, near Nelson, Munro (K.).

SYNONYM: *Danthonia gracilis* Hook. f., Fl. Nov.-Zel., I (1855), 303, t. lxixB.

Differs from the species in the sheaths very conspicuously pilose especially in their upper parts with long spreading hairs about 3 mm. long, the ligule with a conspicuously long tuft at each side, the softer leaves usually flat at the base, and slender graceful habit. Panicle and florets as in the species. Characteristic of the peaty uplands of western Tasmania.

LOCALITIES: *Tasmania*: Madam Howard's Plains, between Queenstown and Strahan, J. Vickery, 20.1.1949 (NSW. 11125); Lake Margaret, J. Vickery, 24.1.1949 (NSW. 11122); Franklin River, on Lyell Highway, J. Vickery, 23.1.1949 (NSW. 11124); 10 miles east of Strahan, J. Vickery, 22.1.1949 (NSW. 11123).

I have not examined the Type of this variety, but it is well illustrated (sub *D. gracilis*) by Hooker in the Florae Novae-Zelandiae. Through the courtesy of Dr. V. D. Zotov I have examined a New Zealand specimen from Maraeroa, King Country, South Auckland, 2,000 feet, coll. T. W. Rawson, 16.1.1947 (ex herb. Bot. Div., Plant Research Bureau, D.S.I.R., New Zealand, No. 56544) which appears to be identical with the Tasmanian specimens.

In the field this variety is of distinctive appearance with its rather soft and graceful habit and conspicuous hairs on the vegetative parts. In Tasmania it appears to occur at moderately high altitudes towards the central and west-coast districts of the island, while the type variety of the species occurs at low altitudes and even right to the foreshores.

16. D. longifolia R.Br., Prod. (1810), 176.

HOLOTYPE: *New South Wales:* Port Jackson, R. Brown, Iter Austral. 1802-5, No. 6231 (BM.; duplicate K.). The specimen has long flexuose leaves and is a rather tall plant of the species.

SYNONYMS: *Avena longifolia* (R.Br.) Spreng., Syst., I (1825), 336; *D. penicillata* F. Muell., Fragm. Phyt. Austral., VIII (1873), 135 pro parte, non Beauv. (1812), non *Arundo penicillata* Labill.; *D. penicillata* var. *longifolia* (R.Br.) Maiden et Betche, Census of N.S.W. Pl. (1916), 22 (incorrectly ascribed there to F. Muell.).

Erect, densely caespitose, subglabrous perennial up to 75 cm. high, with long fine leaves. Culms often not greatly exceeding the leaves, only moderately slender or occasionally rather stout, smooth or minutely scaberulous, 5- to many-noded, the nodes glabrous, the lower internodes shorter than the upper and partially covered with old sheaths, often somewhat wiry. Sheaths often becoming loose from the culms, often exceeding the internodes, striate, more or less smooth, about 6 mm. wide when flattened, with distinct membranous margins. Hairs of the ligule extremely reduced, about 0.1-0.2 mm. long or absent, the ligular region not pilose at the sides. Blades often somewhat flattened and about 2 mm. broad at the base, becoming inrolled-filiform above, firm, somewhat curved or flexuose, very long, up to 35 cm., and sometimes exceeding the culms, the upper culm-leaves also long, smooth or slightly scaberulous between the prominent nerves on the outer (lower) surface, very scaberulous on the inner surface. Panicle 5-15 cm. long, many-flowered, the base tardily enclosed in the uppermost sheath, at length exserted, contracted and more or less lanceolate to linear-lanceolate in outline, the branches more or less erect, up to 6 cm. in length, and, together with the pedicels, finely scabrous. Spikelets pale, greenish to straw-coloured, sometimes lightly tinged with purple, about 5- to 6-flowered, the group of florets not very closely packed, about two-thirds as long as the glumes except for the very shortly exserted awns. Glumes rather narrow, narrowly acuminate, 8-13 mm. long, the lower glume often slightly exceeding the upper, 5-nerved at the base, the membranous margins relatively broad, microscaberulous on the nerves, much diverging, often slightly incurved above. Body of the lemma lanceolate in outline, about 2-2.75 mm. long including the hairy callus, more or less uniformly densely villous all over the back with short (about 0.5-1 mm.) hairs up to a row of long (about 3.5 mm.) hairs placed just below the sinus, rather thin in texture, not shining, obscurely 9-nerved, always pale; lateral lobes about 7 mm. long, distinctly exceeding the upper row of hairs, narrow and delicate, tapering evenly within 2-3 mm. into the capillary setae, the membranous margins very narrow but distinct; central awn delicate, capillary, shortly exceeding (by 2-4 mm.) the lateral lobes, pale or inconspicuously light-brown at the base for 1-2 mm. and only loosely twisted. Palea about 3.5-4 mm. long, much exceeding the sinus, rather narrowly lanceolate to oblanceolate, about 1 mm. wide at the broadest part, minutely bifid at the apex, very minutely ciliolate on the keels, villous on the back in the lower half and with a few hairs between the keels and the margins. Anthers pale or deep yellow, about 1-1.25 mm. long. Caryopsis obovate, 1-1.25 mm. long. Fig. 16.

Localities: *Queensland:* Upper Brisbane River, F. Mueller (K.; MEL.); Spring Bluff, Moreton district, on rocky hillsides on dark grey, fine sand, ca. 1,500 feet, S. T. Blake No. 7730, 21.2.1935 (BRI.; NSW. 1214); Toowoomba, F. M. Bailey (AD.); Wyerba, Darling Downs district, 2,500-3,000 feet, S. T. Blake No. 4567, 19.1.1933 (BRI.; NSW. 1216; K.); Wilson's Peak, J. H. Maiden, 12.1907 (NSW. 1219); Wilson's Peak near Killarney, 4,060 feet, D. A. Goy and L. S. Smith No. 403, 2.5.1938 (BRI.; MEL.); Canungra, Moreton district, ca. 1,500-1,700 feet, S. T. Blake No. 12875, 26.3.1937 (BRI.; NSW. 1215); Messines, via Cottonvale, near Stanthorpe, M. Greener, 12.1930 (K.); Canungra Creek, Lamington National Park, about 2,500 feet, D. A. Goy and L. S. Smith No. 85, 10.1.1938 (BRI.; MEL.); Fort Buchanan, Lamington National Park, about 2,000 feet, D. A. Goy and L. S. Smith No. 253, 16.4.1938 (BRI.; MEL.); Springbrook, 2,000 feet, D. A. Goy and L. S. Smith No. 222, 30.1.1938 (BRI.; MEL.); Mt. Maroon, 2,500-3,000 feet, D. A. Goy and L. S. Smith No. 722, 3.9.1939 (BRI.); Moran's Falls, Lamington National Park, ca. 2,000 feet, D. A. Goy and L. S. Smith No. 74, 10.1.1938 (BRI.); Tambourine Mountains, K. Domin, 1910 (in herb. Domin).

New South Wales: Mt. Warning, at summit, about 4,000 feet, J. Vickery, 15.1.1936 (NSW. 1228); Mt. Lindsay, E. F. Constable, 26.5.1949 (NSW. 10631); Tenterfield to Sandy Flat, J. H. Maiden, 12.1898 (NSW. 1212); Tooloom Range, J. H. Maiden, 12.1907 (NSW. 1231, 1232); near Tenterfield, New England, C. Stuart (K.; MEL.); 7 miles south of Guyra, 4,300 feet, E. N. McKie No. 2003, 27.12.1932 (ADW. 363); Macleay River, Beckler (K.; MEL.); Armidale, R. C. Buck No. 23, 4.1936 (BRI.); The Bulga, E. F. Rudder, 12.1917 (NSW. 1234); Oxley Highway, D. O. Cross, 1937 (NSW. 1222); East of Wallangarra, F. M. Hilton, 14.1.1945 (RAB.); Howell, J. L. Boorman, 12.1914 (NSW. 1206, 1233); Yerranderie, R. H. Cambage No. 3113, 2.11.1912 (NSW. 1207; SYD.); Bluebush Range, Kowmung River, L. Johnson, 28.3.1948 (NSW. 5064); Hunter's Hill, W. M. Carne, 11.1911 (NSW. 1225); Mosman, J. Collings, 10.1938 (CAN.); Bondi, W. F. Blakely, 12.1912 (NSW. 1224); Cooper Park, Sydney district, J. Vickery, 12.11.1943 (NSW. 1223); Cooper Park, L. Johnson, 1948 (NSW. 10126); French's Forest, W. F. Blakely, 12.1912 (NSW. 1226, 1227); Kuringai Chase, common along the edge of the salt water, W. F. Blakely, 1.1.1918 (NSW. 1229); Hawkesbury River, J. B. Cleland, 7.7.1912 (NSW. 1230); The Gib, Bowral, 2,830 feet, F. A. Rodway No. 2093, 15.12.1935 (K.); Macquarie Pass, E. J. McBarron Nos. 2401, 2402, 2404, 21.10.1948 (N.S.W. 2563, 6561, 6562); Cambewarra Range, F. A. Rodway, 12.1928 (K.); Hill Top, E. Cheel, 12.1911 (NSW. 1221); Beach at Narooma, F. A. Rodway, 22.12.1928 (K.); Moruya, on poor country, E. Breakwell, 23.12.1913 (NSW. 1208, 1209); Bermagui district, J. Vickery, 15.1.1940 (NSW. 1211).

Victoria: Cliffs near Boundary Creek at 2,000 feet, N. A. Wakefield No. 2700, 6.1.1949 (NSW. 9349); Tambo River Road, Gippsland, A. W. Howitt No. 1027, 1887 (MEL.); Oakleigh, A. Morrison, 5.12.1894 (K.); Wulmerang Cliffs near Boundary Creek at 2,000 feet, N. A. Wakefield No. 2700, 6.1.1949 (NSW. 9349).

Tasmania: A specimen from Tasmania, coll. L. Rodway, without exact locality or date, probably belongs to this species (HO.).

This species is closely related to *D. semiannularis* but differs in the 5- to many-noded culms, long flexuose leaves, the leaf-sheaths usually not bearded at the orifice, the longer lateral lobes of the lemma with their fine setae distinctly exceeding the upper row of hairs, the more densely villous lemma and the central awn inconspicuously brown and twisted at the short base.

The specimens cited under *D. longifolia* by Bentham in the Flora Australiensis are all referable to this species except for the specimen from Wellington Valley, A. Cunningham, which is *D. eriantha*.

D. longifolia is a rather wiry species characteristic of open forest country on rocky or sandy soils rather than of pastures, and hence is not of any particular economic value. However, it is probably one of the more nutritious grasses found in the type of habitat in which it occurs.

17. D. pauciflora R.Br., Prodr. (1810), 177. Figured in Hooker f., Fl. Tas., II (1860), t. 162.

Holotype: *Tasmania:* Table Mountain (Mt. Wellington), R. Brown, Iter Austral. 1802-5 (BM.). I have not seen this specimen, but there does not appear to be any question as to the identity of the species.

Synonyms: *D. penicillata* F. Muell., Fragm. Phyt. Austral., VIII (1873), 135, pro parte, non Beauv. (1812), non *Arundo penicillata* Labill.

Very small, glabrous, caespitose perennial, mostly 5-15 cm. high, more or less erect, or often growing upwards through peat in alpine localities and then developing an erect rhizome. Culms smooth, about 2-3-noded, the internodes sometimes much reduced in length, the nodes glabrous, sometimes hidden by the lower sheaths. Sheaths glabrous, smooth, shining, the lower often loose. Ligule inconspicuous, shortly ciliate, or that of the lower leaves very short, jagged. Blades inrolled-setaceous, rather fine, firm. Panicle very short, 1-2 cm. long, more or less ovate in outline, with very few (about 4-6) spikelets, typically exserted, or, in small plants, the base somewhat enclosed by the uppermost sheath, the rhachis and pedicels pubescent-villous. Spikelets purplish to straw-coloured, 3-4-flowered, the florets not exceeding the divergent glumes. Glumes 4-7 mm. long, slightly cymbiform, moderately wide, narrowing fairly evenly into the acute (not acuminate) apices, subequal, with distinct membranous margins, 3-5-nerved, the nerves obscure. Lemma short and moderately broad, the body about 1.25-1.5 mm. long including the 0.3 mm. callus, fairly distinctly veined, at length somewhat shining and straw-coloured, glabrous except for a rather sparse row of about 0.7 mm. long hairs above the callus and a dense row of 2 mm. long hairs below the sinus, very rarely also with a few scattered hairs on the back, the callus also sparsely hairy; lateral lobes about 2 mm. long, narrowing fairly evenly into minute setae or sometimes scarcely awned; central awn much exceeding the lateral lobes, very pale brown and once twisted near the base and sharply laterally reflexed. Palea much exceeding the sinus (by about 1 mm.), nearly 2.5 x 0.8 mm., obtuse, truncate or minutely bifid at the apex, oblong, minutely, ciliolate on the keels and very minutely pubescent on the back in the upper part, otherwise glabrous. Anthers pale, about 0.7 mm. long. Caryopsis obovate-oblong, about 1 x 0.6 mm., strongly convex on the embryo side, slightly convex on the back. Fig. 17.

Localities: *Tasmania:* Archer (K.); Mt. Wellington, Gunn No. 1458, 31.1.1840 (MEL.; NSW. 1100; HO.; K.); Mt. Wellington, L. Rodway (HO.); Mt. Wellington, 4,000 feet, R. A. Black, 27.1.1914 (RAB.); Mt. Wellington, 4,100 feet, D. Martin, 31.1.1938 (NSW. 1103); Mt. Wellington, W. M. Curtis, 1.2.1947 (HO.; NSW. 9703); New Town Falls, sub-alpine, F. H. Long (HO.); Mount Field East, 3-4,000 feet, F. Mueller (MEL.); Mt. Field East, J. Vickery, 16.1.1949 (NSW. 7476); Mt. Field West, summit plateau, W. M. Curtis, 2.1948 (HO.; NSW. 9718); Mt. Humboldt, L. Rodway, 12.1896 (HO.); Adamson's Peak, R. A. Black, 29.12.1913 (RAB.); Mt. Lapeyrouse, F. Mueller (K.); Mt. Laperouse, Oldfield (MEL.); Summit of Mt. Laperouse, F. Mueller (MEL.); Mt. Laperouse, L. Rodway, 12.1897 (HO.); Cradle Mt., C. S. Sutton No. 2492, 2.1919 (K.).

So far as I could trace, the specimens cited under the species *D. pauciflora* (but not under the varieties) by Bentham in the Flora Australiensis are referable to that species. I was unable to trace the var. ? *elongata*. The specimen cited under the var. ? *alpina* F. Muell. is referable to *D. nivicola*.

D. pauciflora grows amongst the mat plants of the fellfields found at high altitudes in Tasmania. It is not of any economic importance.

18. D. purpurascens J. Vickery in Contrib. N.S.W. Nat. Herb., I, No. 5 (1950), 301.

Holotype: *New South Wales:* Hornsby, W. F. Blakely, 10.1941 (NSW. 808).

Erect, caespitose perennial, usually moderately tall, 30-90 cm. Culms smooth, much exceeding the leaves, 3-4-noded (rarely more), the internodes exceeding the sheaths. Sheaths glabrous to distinctly hirsute with tubercle-based hairs chiefly from between the veins, at least the upper sheaths more often subglabrous, somewhat striate, often scaberulous between the veins, at length often loose. Ligule shortly ciliate, with long hairs at the margins and on the collar. Blades flat at least at the base or becoming loosely inrolled, 1-3 mm. wide, up to 20 cm. long, firm but not stiff, glabrous to distinctly hirsute but at least the upper leaves usually subglabrous. Panicles much exserted, loose or becoming somewhat contracted on drying, linear, lanceolate or lanceolate-ovate, usually with numerous spikelets but occasionally reduced to few and even sub-simple, 5-20 (usually about 10) cm. long, the branches up to 4 cm. long, scabrous to scabrous-pubescent and sometimes distantly and irregularly hirsute with a few longer hairs especially just below the spikelets. Spikelets greenish tinged with purple, becoming straw-coloured, 4-6-flowered, the florets much shorter than the glumes. Glumes firm, with firmly membranous, usually purplish margins, 10-17 mm. long, irregularly subequal, moderately broad in the lower half, narrowing gradually to the apices, scaberulous on the nerves, sometimes almost finely scabrous on the keel in the upper part, usually 5-nerved. Lemma lanceolate in outline, the body about 3.5 mm. including the 1-1.5 mm. hairy callus, with 2 rows of hairs, the lower row exceeding the smooth, shining back, the upper row placed slightly below the sinus consisting of hairs up to 5 mm. in length; lateral lobes with narrow membranous margins, narrowing very evenly into setae much shorter than or nearly equal in length to the flat portion (often only about 2 mm.), 7-10 mm. long in all; central awn about 9-12 mm. long, shortly exceeding the lateral setae, geniculate about 2-3 mm. from the base, the lower portion brown and once or twice twisted, somewhat exserted laterally from the glumes but not or scarcely exceeding them in length. Palea oblanceolate or elliptical, narrowly truncate or minutely bifid at the apex, minutely ciliolate on the keels, hirsute with few fine hairs on the back and between the keels and margins in the lower part, distinctly exceeding the sinus. Anthers 1-1.5 mm. long, dark orange-yellow. Fruit about 2 mm. long, oblanceolate to narrowly obovate. Fig. 18.

Localities: *Queensland:* Stanthorpe, B. D. Grimes, 2.1934 (BRI.); Wallangarra, 3,000 feet, S. T. Blake No. 4427 in part, 12.1.1933 (BRI.; MEL.; K.; NSW. 3464); Spring Creek Plateau, ca. 3,000 feet, D. A. Goy and L. S. Smith No. 339, 1.5.1938 (BRI.).

New South Wales: Northern Boundary of New England, H. Law (MEL.); Tenterfield, E. N. McKie, 24.11.1938 (NSW. 2530, 2531, 2532); Timbarra, New England, C. Stuart (MEL.; K.); Glen Elgin, J. White-Haney No. 22, 26.3.1930 (NSW. 1680); Glen Elgin, J. W. H., 13.1.1930 (CAN.); Top Dam, Moredun Creek, 23 miles NW. of Guyra, E. N. McKie No. 2017, 6.12.1930 (ADW. 416), and 20.12.1947 (NSW. 7462); Oban Road, 14 miles NE. of Guyra, on granite soil, E. N. McKie No. 638, 18.12.1930 (BRI.; K.); Yooroonah, E. N. McKie, 12.1.1940 (NSW. 1682); Armidale, D. O. Cross, 1937 (NSW. 1630); Armidale, C. K. Ingram, 12.1938 (NSW. 1631); Tamworth district, J. Vickery, 1.1.1935 (NSW. 1675; SYD.); Walcha Road, J. L. Boorman, 12.1912 (NSW. 1634); Morisset, J. L. Boorman, 10.1899 (NSW. 1612); Awaba, J. L. Boorman, 1.1914 (NSW. 1640) and 11.1914 (NSW. 814, 1639); Rylstone, D. O. Cross, 26.12.1942 (NSW. 3924); Newport, C. T. White No. 10294, 12.12.1935 (MEL.); Killara, W. F. Blakely, 12.1914 (NSW. 1613); Roseville, A. Morris, 13.10.1924 (NSW. 1676; ADW.); Roseville, R. A. Black, 22.11.1930 (RAB.); Northbridge, H. M. R. Rupp, 3.10.1940 (NSW. 1620); Waitara, E. Cheel, 2.7.1927 (NSW. 1666); Willoughby, R. Helms, 11.11.1900 (NSW. 811, 1606); R. Brown No. 6233 (BM.; K.; fragment at MEL.); Port Jackson, C. Moore (K.); Port Jackson district, A. Kneucker (Gram. Exsicc. No. 236 (NSW. 1617; K.); Sydney Domain, J. H. Camfield, 17.11.1902 (NSW. 809, 1605); Vaucluse, W. F. Blakely, 10.1912 (NSW. 1616); Bondi-Bronte, W. F. Blakely, 10.1913 (NSW. 1626); La Perouse, Botany Bay, S. T. Blake No. 7484, 31.1.1935 (BRI.; NSW. 1637); Drummoyne, H. Deane, 11.1884 (NSW. 1609); Fivedock, R. A. Black, 11.12.1927 and 19.11.1927 (RAB.); Homebush, J. Vickery, 21.6.1930 (K. 23; NSW. 1619; BRI.); Homebush, G. B. Vickery, 25.4.1929 (NSW. 1674); Rookwood, E. Cheel, 9.1898 (NSW. 1672); Rookwood, O. D. Evans, 5.1926 (SYD.); Lakemba, E. Bennett, 6.11.1939 (NSW. 1635); Carlingford, J. Vickery, 6.10.1930 (K. 66; BRI.); Oatley, R. A. Black, 12.2.1927 (RAB.); Kogarah, J. H. Camfield, 10.1893 (NSW. 813) and 4.1896 (NSW. 1677, 1678); Hawkesbury Agricultural College, J. A. Harris, 31.10.1930 (CAN.); Blue Mountains, E. Betche, 12.1882 (NSW. 1621); Blue Mountains, K. Domin, 4.1910 in part (part of the Type collection of *D. semiannularis* var. *browniana* Domin, Herb. Domin, seen by me at Kew); Woodford, J. H. Maiden, 1.1899 (NSW. 1625); Woodford, D. L. W. Henderson No. 152, 4.1946 (NSW. 2261) and 3.1945

(NSW. 2539); Hazelbrook, R. A. Black, 20.5.1927 (RAB.); Leura, W. M. Carne, 1.1912 (NSW. 1663, 1665); Katoomba, J. H. Camfield, 12.1908 (NSW. 1671); Katoomba, 3,000-3,200 feet, S. T. Blake No. 13904, 21.1.1939 (BRI.); Burragorang, T. F. Mau, 2.1940 (NSW. 1629); Lithgow, J. Vickery, 2.1.1936 (NSW. 812); Quiedong (?), W. Bauerlen, 3.1887 (MEL.); Picton, E. Breakwell, 4.1912 (NSW. 1627); Mittagong, E. N. McKie, 21.11.1941 (NSW. 1633); West Cambewarra, 3 miles NW. of Nowra, F. A. Rodway No. 1606, 12.11.1934 (K.); Nowra, F. A. Rodway No. 3134, 5.11.1940 (K.); Nowra, R. H. Anderson, 12.1934 (NSW. 1618); Kinghorn Head, mouth of the Shoalhaven River, F. A. Rodway No. 610, 18.11.1931 (K.); Milton, E. Breakwell, 12.1913 (NSW. 1673); Bega, E. Breakwell, 12.1913 (NSW. 1628).

Victoria: Bairnsdale, J. Vickery, 25.1.1935 (NSW. 810); Heyfield, Howitt No. 901 (MEL.).

South Australia: Mt. Lofty, J. B. Cleland, 2.6.1945 (JBC.; NSW. 2677).

In Tasmania two forms occur which deviate somewhat from the mainland specimens, but only in matters of degree which make their recognition as separate taxa difficult and probably undesirable at this stage. One of these has generally large spikelets with glumes 15-18 mm. long, the body of the lemma larger, 5-5.5 mm. long, with the upper series of hairs very dense and silky and up to 7 mm. long, the lateral lobes rather longer; the branches of the panicle are generally scabrous and the leaves rather rigid. This form is represented by the following specimens:—

Tasmania: Hobart, L. Rodway No. H1162B, 1.1930 in part (HO.); Knocklofty, Hobart, ca. 500 feet, on dry, barren hill, H. D. Gordon, 29.1.1940 (HO.); L. Rodway No. 1009d in part (HO.); Risdon Cove, J. H. Maiden, 2.1906 (NSW. 19518).

The second Tasmanian form consists of rather slender plants, with the leaves rather finer and more inrolled than in the typical mainland form. The spikelets are rather smaller with glumes 9-15 mm. long, the panicle rather contracted and crowded with the branches pilose, the lateral lobes rather finer and longer. This form seems to furnish a link with *D. eriantha,* but more closely resembles *D. purpurascens* in the more or less included setae and awns, and in the vegetative features. It is represented by the following specimens:—

Tasmania: Blackman's Bay, W. M. Curtis, 1.1947 (HO.; NSW. 9707); Hobart Town, R. Gunn No. 998, 14.12.1840 (NSW. 1659); Cambridge, D. Martin, 1.1934 (NSW. 1657); Mt. Stuart, ca. 500 feet, D. Martin, 4.1933 (NSW. 1658); Mt. Stuart and Mt. Wellington, D. Martin, 3.1933 in part (SYD.); L. Rodway No. 1009d in part (HO.); Risdon, D. Martin, 1.1934 (NSW. 1661).

One of the two specimens cited by Bentham under *D. pallida* var. ? *subracemosa,* viz., "Warwick, Beckler" appears to be a poor specimen of *D. purpurascens.*

The Type collection of *D. semiannularis* var. *browniana* Domin, Biblioth. Bot., LXXXV (1915), 363, consists partly of *D. purpurascens* and partly of *D. linkii.*

The illustration in Trinius, Sp. Gram., t. 52 sub *D. semiannularis* closely resembles *D. purpurascens.*

D. purpurascens differs from *D. caespitosa* in the shorter, firmer, oblong or oblanceolate palea, shorter awns and setae, and usually flatter leaves and more loosely caespitose habit. From *D. eriantha* it differs in the larger panicle, shorter setae and awns, taller and more lax habit, usually less hirsute vegetative parts and broader, flatter leaves. *D. purpurascens* appears to occur chiefly on the coast and tablelands of New South Wales, more rarely in other districts in Australia. It is of some minor value in pastures in the better rainfall areas.

19. D. setacea R.Br., Prod. (1810), 177; non Beauv. (1812); non Hook. f., Fl. Tas., II (1860).

Holotype: *Western Australia:* King George's Sound, R. Brown, Iter Australiense, 1802-5, No. 6236 (BM.; duplicates at K.; MEL.; BRI.).

Synonyms: *D. subulata* Hook. f., Fl. Tas., II (1860), 121, t. 161, non A. Rich., Tent. Fl. Abyss., II (1851), 420; *D. penicillata* F. Muell., Fragm. Phyt. Austral., VIII (1873), 135 pro parte, non Beauv. (1912); non *Arundo penicillata* Labill.

Erect, densely caespitose, usually very slender perennial, 15-60 cm. high. Culms 2-4-noded, sometimes geniculate at the lowest node, usually fine, smooth, or somewhat pubescent just under the panicle, sometimes purplish, much exceeding the leaves, the nodes glabrous. Sheaths usually tightly clasping the culms, or the lower sometimes becoming loose, shorter than the internodes, glabrous or hirsute with tubercle-based hairs, finely striate, sometimes very minutely scaberulous on the sides of the nerves. Ligule reduced to a more or less dense ring of short hairs about 0.5 mm. long, usually with a few longer cilia at the sides. Blades mostly inrolled-filiform, rarely the upper somewhat flat, sometimes curved, 5-20 cm. long, often hirsute with spreading, tubercle-based hairs but sometimes glabrous, distinctly ribbed and slightly scabrous on the upper surface. Panicle at length much exserted, slender, linear, elliptic-lanceolate to ovate-lanceolate in outline, 3-9 cm. long, occasionally subracemose but usually more or less contracted and rather dense, the branches and pedicels short, scabrous-pubescent or pilose with very fine hairs. Spikelets pale-coloured or purplish, 4-10-flowered, the group of florets rather closely placed, half to scarcely two-thirds as long as the glumes except for the shortly exserted awns. Glumes narrow, linear-lanceolate, 8-14 (usually about 10) mm. long, subequal or the lower glume slightly exceeding the upper, early but only narrowly divergent, acute to acuminate, obscurely 3-5-nerved, the membranous margins narrow, smooth or micro-scaberulous towards the tip. Lemma pale-coloured, linear-lanceolate or lanceolate-elliptical in outline, only thinly indurated, obscurely striate, the body about 2-3 mm. long or rarely longer including the 0.5-0.75 mm. hairy callus, 0.75-1 mm. broad, glabrous or with few sparse hairs on the back except for two rows of hair-tufts, the lower series up to 1.5 mm. long, the upper series up to 3 mm. long and sometimes incomplete; lateral lobes narrow, thin, tapering within about 2-3 mm. into capillary setae, the whole lobe about 6-10 mm. long, reaching about to the apex of the glumes; central awn exceeding the lateral lobes by 3-6 mm., twisted and light yellowish-brown in the lower part. Palea shortly exceeding the sinus, 2.5 mm. long, narrowly oblong or oblanceolate, obtuse, very minutely and finely ciliolate on the keels in the upper part, otherwise almost glabrous or with a few hairs towards the margins. Anthers 3, linear, about 0.75 mm. long. Fruit less than 1 to 1.5 mm. long, narrowly oblong. Fig. 19.

Localities: *New South Wales:* Western Interior, C. Moore, 1880 (MEL.); Brewarrina, J. L. Boorman, 11.1903 (NSW. 1695, 2542); between the Darling River and Bogan, L. Morton, 1877 (MEL.); Louth, L. Abrahams, 9.1910 (NSW. 3625); Byrock, E. Betche, 9.1885 (NSW. 1718); Moombooldool, E. N. McKie, 30.10.1938 (NSW. 2544); Coonamble, E. Breakwell, 10.1912 (NSW. 1687, 1710); Nyngan, E. Breakwell, 9.1913 (NSW. 1696, 1697); Nyngan, W. F. Blakely, 10.1912 (NSW. 1701); Nyngan, E. Betche, 10.1885 (NSW. 1712); Cobar, L. Abrahams, 4.1910 (NSW. 1714); Cobar, Haviland, 9.1911 (NSW. 1691); Mudgee Park, D. O. Cross, 10.1933 (NSW. 1713); Fivedock, R. A. Black, 13.11.1927 (RAB.); Homebush, J. Vickery, 20.10.1929 (NSW. 2383); Rookwood, E. Cheel, 11.1918 (NSW. 2382); Cowra, E. Breakwell, 10.1912 (NSW. 1702); between the Darling and Lachlan Rivers, J. Bruckner, 9.1885 (MEL.); Lachlan River, A. Bell, 10.1887 (MEL.); Lower Darling River, Holding, 1889 (MEL.); River Darling (MEL.); Morangarell, G. T. Esplin, 9.10.1939 (NSW. 1698), and 16.11.1939 (NSW. 1684); Alleena via Barmedman, R. E. Winter, 4.6.1931 (NSW. 1688); Oomah via Grenfell, E. Breakwell (NSW. 1716, 1717); Young, E. Cheel, 11.11.1925 (NSW. 1686); Maimura, near Young, H. Robinson, 6.11.1934 (NSW. 1699); Temora, J. W. Dwyer, 11.1916 (NSW. 1685); Narraburra and Trungle Hills between Temora and Barmedman, J. W. Dwyer, 10.1915 (NSW. 1721); Temora Experiment Farm, Kitamura, 14.11.1939 (NSW. 1707); Duck Creek, via Temora, G. Sutherland, 11.1908 (NSW. 1720); Junction of Murray and Darling Rivers, Holding, 1889 (MEL.); Stockinbingal to Grogan, K. H. L.

Key, 10.1937 (CAN.); 5 miles north of Stockinbingal, F. W. Hely, 17.4.1941 (NSW. 2513); Yanco Experiment Farm, E. Breakwell, 11.1913 (NSW. 1706); Yanco, H. Wenholz, 2.1913 (NSW. 1722); Griffith, J. Vickery, 19.10.1949 (NSW. 10632, 10644, 10646); Narrandera, I. W. Cunningham, 1895 (MEL.); Yerong Creek, R. A. Black, 21.10.1933 (RAB.); Reefton, E. T. Goodwin, 15.10.1947 (NSW. 6432); Wagga, E. Breakwell (NSW. 1708); Little Billabong, R. A. Black, 5.12.1936 (RAB.); Henty, R. A. Black, 18.10.1933 (RAB.); Zara, Wanganella, E. Officer, 3.1917 (NSW. 1703); Ivanhoe, via Hay, K. H. Bennett, 8.1886 (NSW. 1719); Jerilderie district, J. Dykes, about 1880 (NSW. 1724); Yerong Creek (MEL.); Holbrook, E. Breakwell (NSW. 3620); Mulwala, R. A. Black, 19.7.1934 (RAB.); 5 miles E. of Tocumwal, J. Vickery, 10.10.1949 (NSW. 10645); Deniliquin, W. M. Willoughby, 12.1945 (CAN.); Wakool River at Kyalite, J. Vickery, 14.10.1949 (NSW. 10643); Tulla, Wakool River district, D. L. W. Henderson No. 146, 10.1945 (NSW. 2262); Barham, J. Vickery, 12.10.1949 (NSW. 10652, 10653); Cunninyenk, D. L. W. Henderson No. 165, 13.10.1946 (NSW. 4348) and No. 156, 19.9.1946 (NSW. 4347).

Victoria: Harvey, 1854 (K.); Mildura, E. Breakwell, 6.1913 (NSW. 1705); Australia felix, F. Mueller, 9.1853 (MEL.); Black Rock, J. H. Willis, 26.10.1940 (MEL. bis); Earlston, R. A. Black, 5.12.1933 (RAB.); Waggarandell, R. A. Black, 16.12.1933 (RAB.); Edward River, F. Mueller, 10.1875 (MEL.); between Echuca and Cohuna, J. Vickery, 12.10.1949 (NSW. 10640); 8 miles W. of Swan Hill, J. Vickery, 19.8.1946 (NSW. 2540); Eldorado, R. A. Black, 10.11.1934 (RAB.); Black Dog Creek, Norong Central, R. A. Black, 23.10.1937 (RAB.); Thoona, R. A. Black, 15.10.1935 (RAB.); Youanmite, R. A. Black, 7.11.1932 and 18.11.1933 (RAB); Yarrawonga, R. A. Black, 8.10.1940 (RAB.); Wilby, R. A. Black, 18.7.1934 (RAB.); Bundalong South, R. A. Black, 27.10.1936 (RAB.; K.); Shepparton, R. A. Black, 24.10.1932 and 16.11.1933 (RAB.); Mooroopna, R. A. Black, 6.12.1933 (RAB.); Nhill district, D'Alton (MEL.); Benalla, R. A. Black, 30.11.1933 and 13.11.1934 (RAB.); Waranga Basin, R. A. Black, 26.11.1934 (RAB.); Acheron, Dandenong Range, J. Vickery, 19.10.1934 (NSW. 3467); Avenal, R. A. Black, 22.11.1932 (RAB.); Natta Yallock, R. A. Black, 20.11.1931 (RAB.); Wimmera, Dallachy (MEL.); Ararat, C. Green (MEL.); Grampians, C. Walter, 12.1887 (MEL.); Grampians, K. Cowle, ca. 1903 (MEL.); Moysten, D. Sullivan, 12.1880 (MEL.); near Shepparton, 16.11.1933 (MEL.); Werribee, W. R. Baker, 26.10.1899 (MEL.); Clarendon, Onkaparinga River, Tepper, 1881 (MEL.); Point Lonsdale, Josephine E. Tilden, South Pacific Plants No. 708, 10-11.1912 (K.); French Island, J. S. Ramsay, 25.11.1904 (MEL.); Kangaroo Flat, near Bendigo, A. J. Tadgell, 11.1934 (MEL.); Whipstick Scrub, near Bendigo, A. J. Tadgell (MEL.); Earlston, near Violet Town (MEL.); Keilor Plain, A. J. Tadgell, 12.1932, and 2.1932 (MEL.); Toolern Vale, A. J. Tadgell, 10.1941, and 12.1932 (MEL.); Deer Park, A. J. Tadgell, 12.1932 (MEL.); Yarra, F. Mueller, 1853 (K.); Melbourne, F. M. Adamson No. 402, 4.11.1855 (K.); Ringwood, 7.12.1929, comm. E. J. Sonnenberg (MEL.); Frankston, Port Phillip Bay, H. B. Williamson (MEL.); Sandringham, A. J. Tadgell, 11.1905, and 3.1906 (MEL.); Barwon, J. B. Wilson, 1883 (MEL.); Southern Croajingolong, N. A. Wakefield No. 2201, ca. 1947 (NSW. 4938); Wilson's Promontory, F. Mueller, 26.5.1853 (MEL.); Wilson's Promontory, P. R. H. St. John, 11.1908 (MEL.); Henty (MEL); Wycheproof district, W. W. Watts, 11-12.1916 (MEL.); Mitcham, A. J. Tadgell, 11.1920 (MEL.).

Tasmania: Gunn (Syntype of *D. subulata* Hook. f.) (K.; BRI.); Flinder's Is., Milne, Voyage of H.M.S. Herald (K.); Flinder's Is., J. B. Cleland, 11.1912 (NSW. 2348, 2349); Clarke Is., E. Maclaine, 1894 (MEL.); King's Is., F. Mueller (MEL.); King's Is., E. Spong, 1882 (MEL.); King's Is., C. French, 11.1887 (MEL.); W. H. Archer (NSW. 2346); Van Diemen's Land, F. Mueller (MEL.); Sister's Hill, NW. Tasmania, R. A. Black, 17.1.1948 (RAB.; NSW. 10793); L. Rodway No. 1009d and 1009e (HO.); George Town, Gunn No. 1456 in part, 27.10.1843 (K., Syntype of *D. subulata* Hook. f.; NSW. 2345); Cataract, Launceston, 2.12.1887 (MEL.); Launceston, No. 158, 30.11.1887 (MEL.); Mt. Direction, R. A. Black, 12.11.1911 (RAB.); Woodburn near Richmond, Oldfield No. 83 and 84 in part (K.); Scotsdale, N. T. Burbidge, 9.1.1949 (CAN. 3036); Cambridge, D. Martin, 1.1934 (NSW. 4344); Cambridge, R. A. Black, 24.11.1913 (RAB.); Lindisfarne, R. A. Black, 22.4.1922 and 19.11.1924 (RAB.); Penquite, Gunn No. 1456 in part, 7.12.1844 (K. Syntype of *D. subulata* Hook. f.; NSW. 2344); Gunn No. 1455 in part (NSW. 2347); Near Port Sorell, NW. Coast, Noor (MEL.); Hobart, L. Rodway, 1.1930 (HO.); Hobart, A. H. S. Lucas, 12.1923 (NSW. 2343); Risdon, J. Vickery, 18.1.1949 (NSW. 7465); Kingston Beach, F. A. Rodway, 25.11.1935 (K.); Marion Bay, W. M. Curtis No. 61, 1.1945 (K.); Russell River, Huon, A. V. Giblin, 11.1929 (HO); Blackman's Bay, W. M. Curtis, 1.1.1947 (HO.; NSW. 9709) and No. 63, 10.1943 (K.); Blackman's Bay, L. Rodway, 11.1928 (HO. H1162); Port Arthur, J. H. Maiden, 2.1906 (NSW. 2350, 2351); Port Arthur, J. Britten, 1892 (MEL.).

South Australia: Hallett, J. B. Cleland, 16.11.1938 (JBC.); Bungara, S. Brown, 12.1906 (NSW. 3623); Adelaide, F. Mueller (MEL.); Beaumont Common, Adelaide, J. B. Cleland, 28.10.1928 (JBC.); National Park, J. B. Cleland, 20.10.1935 and 16.12.1939 (JBC.);

Knoxville, J. B. Cleland, 28.10.1945 (JBC.; NSW. 2676); Clarendon, Tepper, 19.12.1881 (MEL.); Clarendon (AD.); Glen Osmond, J. B. Cleland, 10.1921 (JBC); Unley, J. B. Cleland, 5.11.1930 (JBC.); Aldinga, J. B. Cleland, 31.10.1928 (JBC.; K. Nos. 78 and 80); MacLaren Vale, J. B. Cleland, 30.10.1925 (JBC.); Pinery, J. B. Cleland, 1.10.1932 (JBC.; K. H488); Mt. Barker, F. Liebelt, 6.1936 (ADW.), and Spring 1938 (ADW. 3717, 3720); Kingscote, J. B. Cleland, 26.11.1945 (JBC.); E. of Murray Bridge, 23.10.1943 (CAN.); Mt. Compass, on laterite hill, J. B. Cleland, 26.10.1940 (JBC.; NSW. 2555); Back Valley, Encounter Bay, J. B. Cleland, 28.10.1934 (ADW. 422); Back Valley, off Inman Valley, J. B. Cleland, 25.10.1936 (JBC.); Hindmarsh Valley, J. B. Cleland, 1.1922 (NSW. 3621; JBC.); Naracoorte Range, N. S. Tiver, 18.10.1946 (ADW.); Binnum, N. S. Tiver No. 3, 20.10.1946 (ADW.); Hariorti Range, N. S. Tiver, 18.10.1946 (ADW.); Rocky River, Kangaroo Is., J. B. Cleland, 18.11.1924 and 4.12.1934 (JBC.); Kangaroo Is., R. L. Crocker, 25.11.1940 (ADW. 4350); Hawk's Nest, Kangaroo Is., A. B. Cashmore, 14.11.1934 (ADW. 398); Bingara, S. Brown (NSW. 3622).

Western Australia: Swan River, A. Helmich (MEL.); Upper Swan River, J. Sewell, 1885 (MEL.); Mt. Clarence, J. Staer, 2.1901 (NSW. 2541) and 2.1911 (NSW. 3626); Mallet-Wandoo Hills, E. of Narrogin, C. A. Gardner No. 6553, 27.10.1943 (PERTH); Kalgan, Oldfield (MEL.); Kalgan Plains, J. H. Maiden, 11.1909 (NSW. 1888); Banks of the Blackwood River, Oldfield No. 650 (K.); Blackwood River, Oldfield, 1.1868 (MEL.); Mount Barker, C. A. Gardner, 11.1934 (PERTH; K.); Tolls Creek, Stirling Range, A. Morrison, 31.10.1902 (PERTH; K.); Kauring, on York-Greenhills Line, F. Stoward Nos. 360, 463 and 469 (K.); Bassendean, C. B. Palmer, 1930 in part (K.); Connington, Canning River, ex herb. A. Morrison, 28.11.1900 (K.).

The majority of the specimens which Bentham referred to *D. setacea* when preparing the Flora Australiensis, only a few of which he cited directly, are referable to that species. The specimen from "Woodburn near Richmond, Oldfield No. 83" is largely *D. setacea* but includes also a plant of *D. laevis.* Two sheets from "Victoria, Sullivan" are *D. geniculata.* "Near Freemantle, Oldfield" and "King George's Sound, F. Mueller, 1877" are *D. acerosa.* "Tove River, W. Aust., wet places, Hb. Oldfield" and "Kalgan R., W. Aust., 649, Oldfield" are rather immature specimens of *D. occidentalis.* "Fraser's Range, Dempster, Herb. F. Mueller, 1877" is *D. caespitosa.*

D. setacea can generally be readily distinguished from *D. caespitosa* by its much smaller lemma, finer setae and awns, shorter and more obtuse palea, and the lower part of the lemma more fusiform and less cylindrical in outline. However, robust, larger-flowered forms appear to merge towards small-flowered forms of *D. caespitosa* and are very difficult to distinguish.

D. setacea is a very widespread and abundant species in southern parts of the continent, where it is commonly found associated with *D. caespitosa* and, in N.S.W., with *D. eriantha.* It forms a very significant element in natural pastures and is hence of considerable economic importance as a pasture grass.

19a. Var. **breviseta** n. var.

Ab typo setis lateralibus brevissimis ca 1-1.5 mm. longis, lobis lateralibus cum setis vix 3 mm. longis, arista breviore ex spicula brevissime exserta, spiculis minoribus differt. Glumae 5-8 mm. longae; panicula parva, compacta, 2-3 cm. longa.

HOLOTYPE: *Western Australia:* Lake Wagin, Cronin, 1893 (MEL.; duplicate at NSW. 11,252).

Differs from the Type in the very short lateral setae (1-1.5 mm.), the whole lateral lobes being only about 3 mm. long, the shorter central awn only very briefly exserted from the glumes, and in the smaller spikelets. Glumes 5-8 mm. long; panicle small, 2-3 cm. long, compact.

ADDITIONAL LOCALITY: *Western Australia:* South of Grasspatch (main road from Norseman to Esperance), J. H. Willis, 1.9.1947 (MEL.).

A distinctive-looking form which at first sight seems so unlike *D. setacea* as to be worthy of specific rank. However, it is so similar in vegetative habit and in details of the lemma other than the short lateral lobes and awns, and as it is known only from two collections, I prefer to regard it only as a variety at least until it is better known. Superficially it resembles *D. geniculata,* but details of the lemma are quite different.

20. D. acerosa J. Vickery in Contrib. N.S.W. Nat. Herb., I, No. 5 (1950), 296.

HOLOTYPE: *Western Australia:* Wooroloo, M. Koch No. 1826, 12.1907 (NSW. 2596).

Erect, caespitose perennial, up to 60 cm. high. Culms rather slender, smooth, sometimes finely scaberulous below the nodes, shining, pale or purplish, about 3-noded, the nodes glabrous. Sheaths enclosing the culms, finely striate, scaberulous between the nerves, otherwise smooth. Ligule ciliate. Blades rather fine, inrolled, often (and in the TYPE) rather densely hirsute with tubercle-based hairs, sometimes subglabrous, rather deeply ribbed on the lower surface, mostly 5-15 cm. long. Panicles much exserted, shining, more or less lanceolate in outline, rather loose, the rhachis and pedicels slender, scabrous-pubescent to pilose. Spikelets about 3-6- (often 4-) flowered, the florets much shorter than the glumes except for the shortly exserted awns. Glumes usually purplish, shining, very narrow, thin, tapering into long, acuminate points, 15-25 mm. long, subequal, 3-5-nerved, sometimes microscaberulous especially on the nerves. Lemma slender, linear, with a fine pointed callus more than 1 mm. long, with a row of hairs towards the base and another below the sinus, smooth and glabrous between the rows, the lower series about reaching to the upper, the upper series of hairs up to 4 mm. long; body of the lemma about 3.5 mm. long including the callus, about 0.75 mm. broad; lateral lobes about 10-12 mm. long in all, narrow and membranous at the base, tapering within about 3-5 mm. into the capillary awns; central awn 13-18 mm. in all, brown and twisted at the base for about 6 mm. Palea narrow-oblong to linear, slightly exceeding the sinus, about 3 mm. long, obtuse or very minutely bifid, very minutely ciliolate on the keels, otherwise glabrous. Fig. 20.

LOCALITIES: *Western Australia:* A. G. Hamilton, 1902 (NSW. 2598); J. H. Maiden, 11.1909 (NSW. 2599); Champion Bay, Oldfield (MEL.; K.); Peel Estate, G. K. Baron Hay, 11.1924 (MEL.); Peel Estate, C. A. Gardner, 11.1924 (PERTH.; K.); Midland Junction, F. Stoward, 11.1914 (NSW. 2600); Freemantle, Oldfield (MEL.; K.); Cannington, Canning River, ex herb. A. Morrison, 11.11.1910 (K.); Wickspun, W. J. Petticrew, 7.1915 (PERTH); Harvey, F. Stoward, 11.1911 (NSW. 2602); Picton, ex herb. A. Morrison, 26.10.1898 (K.); Boyanup, S.W., C. J. Parish, 2.10.1900 (PERTH); Preston River., G. F. Berthoud, 1896 (MEL.); Blackwood River, Hard (MEL.); Stirlings Range, F. Mueller, 10.1867 (MEL.); Upper Hay River, F. Mueller (MEL.); Esperance, F. J. Daw, 10.1903 (NSW. 3641); King George's Sound, F. Mueller, 10.1867 (MEL.) and 1877 (K.); King George's Sound, J. H. Maiden, 11.1909 (NSW. 2601); Darling Range, ex herb. A. Morrison, 29.11.1898 (K.).

In general appearance this species resembles *D. occidentalis,* but differs in the lemma being glabrous between the two series of hairs. It can be distinguished from *D. setacea* R.Br. by its larger spikelets and more linear needle-like lemma, long acute callus and more robust awn. In some respects it is very close to some forms of *D. caespitosa,* but differs from most forms in its more linear lemma with narrower membranous margins of the lateral lobes and shorter palea.

A specimen from "Swan River, Drummond, Herb. Hook." which was named and cited by Bentham in the Flora Australiensis as *D. pilosa* is *D. acerosa;* it is mounted with a single panicle of *D. occidentalis.* "Swan River, Drummond, 1839, No. 159, Herb. Benth." and "Champion Bay, Oldfield" named *D. semiannularis* by Bentham are *D. acerosa.* "Nr. Freemantle, W.A., Hb. Oldfield" and "King George's Sound, F. Mueller, 1877", named and cited by Bentham as *D. setacea* are also *D. acerosa.*

21. D. alpicola J. Vickery in Contrib. N.S.W. Nat. Herb., I, No. 5 (1950), 297.

LECTOTYPE: *Victoria:* Mount Buller, F. Mueller (K.; duplicate MEL.).

SYNONYM: *D. semiannularis* var. *alpina* Benth., Fl. Austral., VII (1878) 595.

Erect, caespitose, glabrous perennial, 10-30 cm. high. Culms smooth, rather rigid, the internodes often concealed by the sheaths, 3-4-noded, the nodes glabrous. Sheaths firm, rather thick, smooth, somewhat striate above, sometimes purplish tinted, the basal sheaths loose. Ligule minutely ciliolate or very reduced, sometimes with long hairs at the sides. Blades thick, rigid, closely folded or inrolled, rarely almost flat and up to 4 mm. wide at the base, smooth and striate on the outer surface, glabrous, rather pungent-pointed, the tips keeled, 5-10 cm. long, finely and closely striate on the inner surface. Panicles not or shortly exserted, contracted, dense, ovate to ovate-lanceolate, about 3-4 cm. by 2-2.5 cm., the panicle branches smooth to minutely pubescent. Spikelets purplish, becoming straw-coloured, 4-6-flowered, the group of florets about two-thirds as long as the glumes except for the exserted awns. Glumes subequal, acute, rather narrowly divergent, 12-17 mm. long, about 5-nerved. Lemma linear-lanceolate in outline, the body about 3.5 mm. long including the short hairy callus, pilose with two rows of tufts of hairs placed respectively just above the callus and just below the sinus, the margins pilose, otherwise generally smooth and glabrous, sometimes with a few scattered hairs on the back; lateral lobes membranous at the base for about 3-5 mm., narrowing into the 3-5 mm. setae; central awn about 10-17 mm. long, twisted at the base for 2-3 mm., much exceeding the lateral lobes. Palea linear-lanceolate, much exceeding the sinus, about 5.5-7 mm. long, narrowly truncate or bifid at the apex, with firm keels, glabrous on the back, minutely ciliolate on the keels in the upper part, with a few long hairs between the keels and the margins below the middle. Anthers yellow. Caryopsis oblong, about 2 mm. long. Fig. 21.

LOCALITIES: *New South Wales:* Mt. Kosciusko, 6000-7000 feet, J. H. Maiden and W. Forsyth, 1.1899 (NSW. 4381); Mt. Kosciusko, J. H. Maiden and W. Forsyth, 1.1900 (NSW. 4383); Mt. Kosciusko, A. B. Costin, 3.1949 (NSW. 7644); The Chalet, Kosciusko, 6050 feet, L. A. S. Johnson and E. F. Constable, 18.1.1951 (NSW. 15754).

Victoria: Bogong Range, 6-7000 feet, F. Mueller, 1855 (K., Syntype; Mel.); Mt. Bogong, A. J. Tadgell, 2.1923 (MEL.); Head of Big River, below Spion Kopje, Bogong High Plains, ca. 5,600 feet, J. H. Willis, 3.2.1949 (MEL.); The Horn, Mt. Buffalo, 5,500 feet, S. T. Blake No. 7400, 26.1.1935 (BRI.; NSW. 4384; MEL.); Mt. Feathertop, 5000 feet, A. J. Tadgell, 3.1917 (MEL.); Feathertop, Mt. Hotham, A. J. Tadgell, 1.1922 (MEL.); Mt. Hotham, J. H. Maiden, 1.1900 (NSW. 4382); Mt. Hotham, A. J. Tadgell, 12.1914 (MEL.); Mt. Hotham, eastern approach, A. J. Tadgell, 1913 (MEL.); The Viking, 5,000 feet, Barry Mts., J. H. Willis, 31.12.1944 (MEL.); Mt. Buller, stony subalpine meadows, F. Mueller, 22.3.1853 (Syntype, MEL.).

This species is doubtless closely related to *D. caespitosa,* from which, however, it differs strikingly in its rather short, thick, rigid leaves, and short contracted inflorescence. The varietal epithet *alpina* given by Bentham is not available for use in specific rank for this species.

22. D. caespitosa Gaud. in Freycinet, Voyage autour du Monde par des Corvettes l'Uranie et la Physicienne pendant 1817-20, 4, Botanique (1826), 408; Kunth, Rev. Gram., II (1829), 525, t. 177; Kunth, Enum., I (1833), 313. Figured in Turner, Austral. Grasses, (1895), 19 sub *D. semiannularis;* Agric. Gaz. N.S.W., I (1890), 313, and II (1891), 719 sub *D. semiannularis;* Journ. Ag. Vict., XV (1917), 714 sub *D. penicillata;* Journ. Ag. W. A., XIII (1906), 71 and XIV (1906), 16 sub *D. semiannularis;* Gardner, Fl. W. A., I, Gram., (1952) 55 sub *D. semiannularis.*

HOLOTYPE: *Western Australia:* Baie des Chiens-Marins (Shark's Bay), Gaudich (PARIS MUS. NAT. HIST.).

SYNONYMS: *D. varia* Nees in Hook. Lond. Journ. Bot., II (1843), 416; Lehm., Pl. Preiss., II (1846-7), 103; *D. penicillata* F. Muell., Fragm. Phyt. Austral., VIII (1873), 135 pro parte, non Beauv. (1812), non *Arundo penicillata* Labill.

Very variable, erect, caespitose perennial, 20-90 cm. high. Culms smooth, 2-4-noded, sometimes the whole internode enclosed by the sheath until late in development, slender to rather robust, the nodes glabrous. Sheaths rather densely hirsute with tubercle-based hairs up to 2 mm. long to almost glabrous, the upper sheaths seldom very hairy. Ligule ciliate, the lateral hairs and those on the collar rather long. Blades flat or loosely involute, occasionally finely involute and somewhat flexuose, usually narrow and not exceeding 2 mm. in width but sometimes up to 4 mm., usually up to 25 cm. long but sometimes much longer especially in some Western Australian specimens, sometimes exceeding the culms in the early stages of flowering, hirsute to glabrous. Panicles sometimes tardily and shortly exserted, at other times much exserted, loosely contracted, linear-lanceolate to lanceolate in outline, rarely ovate, usually with about 10-30 or more spikelets, the panicle branches either conspicuously or minutely and obscurely scabrous to almost smooth, rarely slightly pilose. Spikelets 4-9- (usually 7-9-) flowered, light green or pale-coloured, the glumes usually exceeding the laterally compressed and divergent group of florets except for the exserted awns, but occasionally the group of florets cohering in a cylindrical mass and equal to or exceeding the glumes. Glumes 14-24 mm. long, subequal or the upper slightly exceeding the lower, long-acuminate, widest towards the base, somewhat shining, usually glabrous but occasionally remotely hirsute, 5-7-nerved, greenish between the membranous margins. Lemma light in colour, narrow lanceolate in outline, with two rows of hairs on the back and glabrous between, the lower row placed near the base and consisting of hairs usually almost equalling or shortly exceeding the smooth back, the upper row placed about 0.5-1 mm. below the sinus, usually dense but occasionally sparse and consisting of hairs 4-5 mm. in length usually almost equalling the flat portions of the lateral lobes, the body of the lemma usually about 4-6 mm. long including the 0.75-1.5 mm. hairy callus but sometimes shorter, thinly indurated; lateral lobes with membranous outer margins of variable width but typically rather narrow, the flat lower portions usually about 4 mm. long, narrowed into fine setae often nearly twice as long; central awn strong, typically 15-25 mm. long, much exceeding the lateral lobes, strongly exserted from the glumes, the lower brown closely twisted portion 2-7 mm. long and often much exceeding the flat parts of the lateral lobes. Palea rather variable but usually much exceeding the sinus, about 4.5-5 long, bifid, narrow lanceolate, typically drawn out into a membranous tip, glabrous on the back, minutely ciliolate on the margins at least in the upper part, pilose with very fine hairs between the keels and the margins. Anthers usually about 0.5 mm. long, occasionally up to 2 mm., usually pale yellow. Caryopsis broadly and obtusely oblanceolate or narrowly obovate. about 1.5 mm. long. Fig. 22.

LOCALITIES: *New South Wales:* Moombooldool, E. N. McKie, 20.10.1938 (NSW. 4081); Plains near Baradine, W. Forsyth, 10.1899 (NSW. 4140); Dubbo, J. Roberts, 10.1905 (NSW. 4100); Narromine, E. Breakwell, 4.1913 (NSW. 4117); Nevertire, J. H. Camfield, 11.1892 (NSW. 4120); Nevertire, R. Helms, 11.1892 (NSW. 4123); Nyngan, E. Breakwell, 9.1913 (NSW. 4113, 4242); Nyngan, E. Betche, 10.885 (NSW. 4122); Nyngan, W. F. Blakely, 10.1912 (NSW. 4116); Cobar, Reuss, 1922 (NSW. 4070); Wilcannia, Darling River, Kennedy, 1885 (MEL.); Barrier Range, M. I. Collins, 9.1921 (CAN. 643; SYD.); Western Interior of N.S.W., C. Moore, 1880 (MEL.); Barrier Range, Irvine (MEL.); Thackaringa, Tate Collection, 20.8.1921 (AD.); Barrier Range, Woolls (NSW. 4085); Southern Barrier Range, H. Deane, 1893 (MEL.); Broken Hill, E. Cheel, 8.1926 (NSW. 4068); Broken Hill, I. Pidgeon and J. Vickery, 23.8.1939 (NSW. 4241); Broken Hill, M. Morris No. 2800, 20.9.1924 (NSW. 4114); Broken Hill, A. Morris, 1.1920 (NSW. 4075), No. 140, 2.1920 (ADW.), and 21.9.1920 (N.S.W. 4074); Broken Hill, E. C. Andrews, 9.1918 (N.S.W. 4073); Mudgee Park, D. O. Cross, 10.1933 (NSW. 4059, 4172); Forbes, G. A. Fletcher, 11.1904 (NSW. 4083); Maimura near Young, H. Robinson, 6.11.1934 (NSW. 4175); Mosman, J. B. Cleland, 8.11.1914 (NSW. 4221); Ball's Head, Sydney, R. A. Black, 28.4.1928 (RAB.); Euabalong, J. L. Boorman, 5.1906 (NSW. 4063); West Goulburn, J. Lumsden, 11.1906 (NSW. 4098); Oomah via

Grenfell, E. Breakwell No. P1 (NSW. 4121); Temora district, W. C. Duggan, 21.11.1939 (NSW. 4180, 4183); Temora Experiment Farm, Kitamura, 14.11.1939 (NSW. 4171); Barmedman district, R. E. Winter, 4.6.1931 (NSW. 4057); Gilmore near Tumut, J. L. Boorman, 10.1916 (NSW. 4118); Wagga, E. Breakwell No. F1 (NSW. 4064); Wagga Wagga, E. Breakwell (NSW. 4097); Howlong Road, Albury, E. J. McBarron No. 1163, 16.10.1947 (NSW. 4615) and No. 1195, 21.10.1947 (NSW. 4616); Riverina, A. N. Grant, 1882 (MEL.); Henty, R. A. Black, 18.10.1933 and 23.10.1933 (RAB.); Yanco, E. Breakwell (NSW. 4142) and 11.1913 (NSW. 4244); Griffith, J. Vickery, 18.10.1949 (NSW. 10687, 10699); Demondrille, E. Cheel, 13.11.1935 (NSW. 4065, 4176); 5 miles E of Tocumwal, J. Vickery, 10.10.1949 (NSW. 10684, 10685); Barooga, J. Vickery, 11.10.1949 (NSW. 10686, 10692); Deniliquin, W. M. Willoughby, 12.1945 (CAN. 11504), and 17.1.1946 (CAN. 11519); Albury, T. H. Patterson, 10.1916 (NSW. 5104); Tulla Station, Barham, D. L. W. Henderson No. 149, 4.12.1945 (NSW. 4111), No. 144, 31.10.1945 (NSW. 4110), No. 153a and 153b, 2.11.1945 (NSW. 4066, 4067); Barham, J. Vickery, 13.10.1949 (NSW. 10675, 10680); Cunninyenk, D. L. W. Henderson No. 159, 2.10.1946 (NSW. 4246) and 13.10.1946, No. 173 (NSW. 4245), No. 163 (NSW. 4254), No. 164 (NSW. 4106), No. 167 (NSW. 4108), No. 167a (NSW. 4109), and No. 168 (NSW. 4107); Barham, D. L. W. Henderson, No. 148, 3.11.1945 (NSW. 4058); Wakool River, S of Balranald, J. Vickery, 14.10.1949 (NSW. 10683, 10693); S of Balranald, J. Vickery, 14.10.1949 (NSW. 10682); Balranald to Euston, J. Vickery, 15.10.1949 (NSW. 10669, 10688); Hay, J. Vickery, 18.10.1949 (N.S.W. 10670); Hay, M. T. Little, 11.1912 (NSW. 4099); River Darling, Vict. Exped. (MEL.); between the Darling and Lachlan, Burkitt (MEL.); Junction of Murray and Darling Rivers, Holding, 1889 (MEL.); Kooringa, Young, G. T. Esplin, 22.10.1928 (NSW. 4115); Wentworth, J. Vickery, 16.10.1949 (NSW. 10677).

Victoria: Between Euston and Mildura, J. Vickery, 15.10.1949 (NSW. 10689); 4 miles SW of Mildura, Easterbrook, 11.1947 (MEL.; NSW. 4806); Swan Hill, J. G. Luehmann, 1890 (MEL.); W of Swan Hill, J. Vickery, 14.10.1949 (NSW. 10696, 10687); Dumosa, W. W. Watts No. 669, 10.1917 (NSW. 4240); between Echuca and Cohuna, J. Vickery, 12.10.1949 (NSW. 10681); Youanmite, R. A. Black, 18.11.1933 (RAB.); Youanmite, 18.11.1933 (MEL.); Wycheproof district, W. W. Watts, 10.1917 (NSW. 4095); Kaniva, W. W. Watts, 10.1917 (NSW. 4093, 4105, 4219); Euroa, R. A. Black, 16.11.1933 (RAB.); Toolern Vale, A. J. Tadgell, 12.1932 (MEL.); Port Fairy, W. T. Whan (NSW. 4096); Wimmera, Dallachy (MEL.); Waranga Basin, R. A. Black, 26.11.1934 (RAB); Hawkesdale, W. B. Williamson, 10-11.1903 (MEL.); between Melbourne and Tooradin, S. T. Blake No. 7270, 20.1.1935 (BRI.; NSW. 4234); St. Albans, A. J. Tadgell, 11.1944 (MEL.); Myrniong, T. A. Brittlebank, 1899 (MEL.); Southern New Holland, F. Mueller (MEL.).

Tasmania: A. H. S. Lucas (NSW. 4227); Penquite, Gunn No. 1452 (K.; fragment at MEL.); Mt. Stuart, 500 feet, D. Martin, 4.1933 (NSW. 807); Berriedale, D. Martin, 1.1934 (NSW. 4225); Risdon, D. Martin, 1.1934 (NSW. 1882); Rokeby, L. Rodway, 12.1899 (HO.); Hobart, W. M. Curtis, Nos. 57 and 59, 7.12.1943 (K.); Sandy Bay, Hobart, W. M. Curtis, 12.1943 (HO.; K.); Hobart, A. H. S. Lucas, 12.1923 (NSW. 806, 4223, 4243); Hobart, L. Rodway, 1.1930 in part (HO.); Domain, Hobart, W. M. Curtis, 12.1943 (HO.; K.); Botanical Gardens, Hobart, W. M. Curtis, 12.1943 (HO.); Domain. Hobart, R. A. Black, 12.1909 (RAB.); Blackman's Bay, L. Rodway, 11.1928 (HO.); Cambridge, R. A. Black, 24.11.1913. (RAB.); Southport, No. 1562 (MEL.); Southport, Stuart (MEL.); Gardiner's Bay, Huon River, W. M. Curtis, 12.1943 (HO.; K.); Goat Hill, South Arm Road, W. M. Curtis, 24.12.1946 (HO.; NSW. 9706); Blackman's Bay, W. M. Curtis, 2.12.1945 (HO.; NSW. 9716); Lindisfarne, R. A. Black, 30.11.1924 (K.); Blowhole, Eaglehawk Neck, J. Vickery, 15.1.1949 (NSW. 9765); N of Eaglehawk Neck, J. Vickery, 15.1.1949 (NSW. 9764).

South Australia: Koonamore, T. B. Paltridge, 23.10.1930 (CAN. 633); Koonamore Vegetation Reserve, T. B. Paltridge, 20.12.1930 (AD.); Flinders Ranges, ENE of Port Augusta in Pichirichi Pass, S. T. Blake No. 16865, 29.8.1946 (BRI.); Flinders Ranges, Hookerina Creek, S. T. Blake No. 16923, 1.9.1946 (BRI.); Flinders Ranges, near Blinman, S. T. Blake No. 16901 and 16902, 31.8.1946 (BRI.); below Rownsley's Bluff, Flinder's Range, N. T. Burbidge, 30.8.1946 (CAN. 13133); Port Germein Gorge, Flinder's Range, N. T. Burbidge, 29.8.1946 (CAN. 13136); Pichi Pichi Pass, Flinder's Range, 28.9.1946 (CAN. 13137, 13138, 13139); Port Germein Gorge, J. B. Cleland, 23.9.1942 (JBC); Ooldea Soak, J. B. Cleland, 8.1922 (JBC; NSW. 4250); Wilpena Pond, J. B. Cleland, 10.11.1928 (JBC); Hawker, J. B. Cleland, 16.8.1921 (JBC); West Coast, 40 miles from Port Augusta, T. P. Richards, 9.1886 (MEL.); Yudnapinna Station, Port Augusta, N. T. Burbidge, 10.9.1946 (CAN. 13135); Mt. Remarkable, J. B. Cleland, 8.11.1936 (JBC); Quorn, J. B. Cleland, 2.9.1941 (JBC); Port Augusta, J. B. Cleland, 19.7.1943 (JBC); Appila, L. Wehl, 1884 (MEL.); Crystal Brook, F. Mueller, 11.1851 (MEL.); Woods Point, H. A. Follett (ADW. 3780), and 22.11.1937 (ADW.); Spencer's Gulf, I. Felstead (MEL.); Yorke Peninsula, E. Beythrin, 1888 (MEL.); Yorke Peninsula, Tepper, 1879 (MEL.); Millbrook, J. B. Cleland, 25.10.1924 (JBC.; NSW. 4201); Blanchetown, J. B. Cleland, 28.8.1946 (JBC); Colton, Eyre Peninsula, R. L. Crocker, 11.10.1944 (CAN. 11636); Cudnaka, F. Mueller,

Hawker

10.1951 (MEL.); Hanover, J. B. Cleland, 8.1921 (NSW. 4090); Poalka, Bimbourie, R. L. Crocker, 23.9.1939 (ADW. 4589); Hundred of Kuitpo, W. Gill, 11.1905 (NSW. 4076); Glen Osmond, J. B. Cleland (NSW. 4257), and 22.10.1921 (JBC.; NSW. 4264); Beaumont Common, Adelaide, J. B. Cleland, 17.10.1926 (JBC.; NSW. 4061), and 28.10.1928 (JBC.); Beaumont Common, Adelaide, J. Vickery, 23.8.1946 (NSW. 4235, 4237); National Park, J. B. Cleland, 26.11.1932 (JBC.; NSW. 4198), and 25.10.1935 (JBC.; NSW. 4204); Morialta, J. B. Cleland, 30.10.1920 (JBC.; NSW. 4255); Northfield, Adelaide, J. B. Cleland, 22.9.1940 (JBC.); Corona, in clay pans, Tate Collection, 5.9.1921 (AD.); Wyalla Knob, J. B. Cleland, 1.9.1944 (J.B.C.); Beaumont, J. B. Cleland, 17.10.1926, 28.10.1928 and 28.10.1945 (JBC); Fullarton, J. B. Cleland, 28.10.1928 (JBC.); Adelaide, S. T. Blake No. 16810, 23.8.1946 (BRI.); Adelaide, M. Koch No. 922, 11.1902 (NSW. 4258); Marino, J. B. Cleland, 8.10.1932 (JBC), and 15.9.1934 (JBC.; NSW. 4256); Racecourse, Adelaide, J. B. Cleland, 24.9.1946 (JBC.); Cultivated at Waite Agricultural Research Institute, Adelaide, No. Ga.128, H. C. Trumble, 1930 (MEL.), and No. Ga.38, 1930 (MEL.; ADW. 419); Laura Bay, R. S. Rogers, 9.1907 (NSW. 4071); Port Lincoln, J. B. Cleland, 17.12.1941 (JBC.); Mount Barker, F. Liebelt, June 1936 and Spring 1938 (ADW. 3721), Spring 1938, No. 4 (ADW. 3708), No. 5 (ADW. 3709), No. 11 (ADW. 3715); No. 12 (ADW. 3716), No. 14 (ADW. 3718) and No. 18 (ADW. 3722); Clarendon, Tate Herbarium (A.D.); Hallett's Cove, J. B. Cleland, 28.10.1932 (JBC.; NSW. 4202); Aldgate, O. E. Menzel, 11.1896 (AD.); Encounter Bay, J. B. Cleland, 29.5.1921 and 19.12.1940 (JBC).; Point Macleay, J. B. Cleland, 11.1921 (JBC.; NSW. 4228); near Murray Bridge, R. L. Crocker (CAN. 11676); E of Murray Bridge, R. L. Crocker, 23.10.1943 (CAN.); Kinchina, J. B. Cleland, 9.1922 (NSW. 4251) and 8.11.1924 (JBC.); near Mt. Gambier, Well, 1880 (MEL.); near Goolwa, J. B. Cleland, 23.11.1935 (JBC.); Kingscote, Kangaroo Island, J. B. Cleland, 16.11.1914 (JBC.).

Western Australia: Drummond (MEL.); Bow River, S. W. Jackson, 11.1912 (NSW. 4087, 4089); Bowgada, A. Dickson, 27.9.1926 (PERTH; K.); Kalgoorlie, J. H. Maiden, 9.1909 (NSW. 4079, 4088); Moorine Rock, Coolgardie district, C. A. Gardner, 1.10.1931 (PERTH); Kurrawang, J. H. Maiden, 9.1909 (NSW. 4077); Mollevin, N of Koorda, C. A. Gardner, 9.1939 (PERTH); Cowcowing, M. Koch No. 1200, 9.1904 (MEL.), 10.1904 (AD.; MEL.; NSW. 4086) and 10.1917 (K.); Buller R., N of Geraldton, S. T. Blake No. 18078, 2.9.1947 (BRI.); between Kunnunoppin and Mt. Marshall, about long. 118°, lat. 31° and Lake Barlee, long. 119-120°, lat. 29-30°, F. Fraser, Winter-Spring 1919 (NSW. 4080); Yorkrakine, C. A. Gardner, 12.1925 (PERTH; K.); Muchea, Midland Railway, A. Morrison, 11.1909 (K.); near Chidlow, C. A. Gardner No. 6506, 22.10.1943 (PERTH); Kauring, on York-Greenhills Line, F. Stoward, Nos. 365, 366, 460, 461, 467, 471 (K.); Grass Valley, A. Despeissis, 10.1898 (PERTH); Dwarda, G. K. Baron-Hay, 11.1024 (PERTH); Dwarda, A. T. O'Connell, 11.1923 (K.); Bassendean, C. B. Palmer, 1930 (K.); Bowes River, Oldfield (MEL.); Swan River, Nos. 155, 161 and 189 (K.); Swan River, Drummond, 1939, ex herb. Lindley (CGE., Holotype of *D. varia* Nees); Northampton, Champion Bay, R. Helms, 10.1898 (PERTH); near Perth, 12.1849 (MEL.); between Esperance Bay and Fraser's Range, Dempster, 1876 (MEY.); Grasspatch, N of Esperance, C. A. Gardner, 10.1934 (PERTH); Fraser's Range, R. Helms (NSW. 4072, 4091, 4092; MEL.); Fraser's Range, Dempster, 1876 (MEL.); Bremer Bay, J. Willstead, 1900 (PERTH); Bremer River, Webb (MEL.).

A very widespread species extending over the greater part of the southern half of the continent and into Tasmania. The typical form is the characteristic species of the dry parts of Australia, where it is one of the most valuable of the native pasture grasses, less bulky than the associated species of "Spear Grasses", but of higher palatibility and nutritive quality.

The species is highly variable, exhibiting a very wide range of forms, many of which, so far as can be determined from herbarium specimens, appear to be inconstant. Some of the variation in form exhibited appears to be a direct result of environment, and of the influence of the immediate seasonal factors affecting the development of the plant, but it may prove that other variations may be due to genetic differences. Elucidation of the factors determining this variation must await the work of geneticists and ecologists.

Attempts to segregate sub-specific taxa within the species have not been successful, as although certain specimens or groups of specimens may show combinations of characters that appear to justify recognition, others show recombinations of these characters in such a way as to cut across any projected scheme of classification. Similarly many of these variants do not appear to be related at all closely to geographic distribution.

The plants may vary in size and thickness of the culms. The leaves vary in breadth, degree of inrolling or flatness, softness or stiffness, and may be glabrous to very hirsute. The inflorescence varies in its density and shape, and the rhachis while usually scabrous may very occasionally be somewhat pilose as in *D. eriantha.* The spikelets are usually laterally flattened, but sometimes more turgid as in *D. duttoniana.* The florets are generally loose but may sometimes embrace one another closely as in *D. racemosa.* The lemmas may be scarcely larger than those of *D. setacea,* or so large that only the long range of intermediates can give credibility to the assumption that they are conspecific. The body of the lemma is normally glabrous between the rows of hairs, but occasionally may bear some sparse hairs. The upper row of hairs is normally complete and dense, but occasionally the tufts are rather sparse and incomplete showing an approach to the condition found in *D. pilosa* or *D. racemosa.* The lemma may approach that of *D. acerosa* in slenderness, or be almost as broad as that of *D. eriantha,* but is generally of moderate slenderness. The lateral lobes may be quite narrow to quite broad. The lower row of hairs is usually situated close above the callus, but may at times be situated well above it simulating the condition found in *D. racemosa.* The proportions of the central awn and the lateral setae to each other, to the body of the lemma and to the glumes is also very variable. The palea is typically long and narrow, but becomes shorter and broader in forms which approach *D. eriantha* or *D. setacea.*

Such variations make consistency of taxonomic treatment very difficult of attainment. As might be expected some of the variations cause this species to approach certain others in particular characteristics, and this aspect has been discussed in the introduction. Thus *D. caespitosa* shows affinities in particular with *D. setacea, D. duttoniana, D. acerosa, D. eriantha, D. purpurascens, D. alpicola, D. procera, D. laevis, D. pilosa* and *D. racemosa.* Extreme forms within the range of material which I have referred to *D. caespitosa* (including a large number of specimens not here cited) might seem equally as worthy of recognition in some taxonomic category as do some of these species. The extensive series of specimens I have studied have left me unable to afford such recognition in the light of present knowledge.

The Holotype of *D. caespitosa* from Shark's Bay is a small-flowered specimen with relatively shortly exserted awns, and is apparently from a slender plant. The Holotype of *D. varia* is a robust plant with a large inflorescence and large spikelets. Both have the typically elongate palea. I am forced to regard them as conspecific and merely variants of the complex population described above.

In the Flora Australiensis Bentham referred several specimens of this species to *D. semiannularis.* As a result of his description under that name *D. caespitosa* has been very extensively confused with *D. semiannularis* as has been evident during my study of material in Australian and British herbaria.

D. caespitosa var. *gracilis* Nees in Hook. Lond. Journ. Bot., II (1843), 417 was described from a specimen collected by Drummond at Swan River. Amongst the specimens collected by Drummond in the herbarium at Cambridge I was unable to identify any one as the Type of this variety, and so cannot reach any positive conclusion as to its identity. The only description offered by Nees is "racemo subsimplici". I would surmise that it represents merely an impoverished specimen of *D. caespitosa.*

23. **D. duttoniana** Cashmore, in Comm. of Austral., C.S.I.R., Bull. 69 (1932), Append., 2, figured; Trans. & Proc. Roy. Soc. S. Austral., LVII (1933), 72.

LECTOTYPE: Cultivated in single plant tests in the field, Waite Institute (Adelaide, South Australia), seed from plants growing spontaneously at Werribee (Victoria), A. B. Cashmore No. Ga 65, 2.12.1932 (ADW.; NSW. 19682). In his description Cashmore cites three localities thus: "Mt. Lofty Ranges; Victoria; New South Wales", but there seems no doubt that he drew up his description from material cultivated at the Waite Institute from seed obtained from those sources. Of these, he has written "Type" only on herbarium material of plants grown from seed collected at Werribee, Victoria, and this has therefore been selected as the Lectotype.

Erect, densely caespitose, moderately robust, glabrous perennial, up to 80 cm. high. Culms often rather stout, up to 2 mm. diameter, smooth, shining, somewhat compressible, the internodes usually at length much exceeding the sheaths, the nodes glabrous, brown. Sheaths rather loose, lightly striate, smooth. Ligule reduced to a row of short dense cilia, about 0.5 mm. long, sometimes bearded at the edges. Blades firm, comparatively wide, e.g. 2-3.5 mm. wide, the basal leaves often finer, tapering gradually to a rather obtuse, keeled apex, usually folded about the midrib when dry, rather long, e.g. up to 20 cm., green and smooth on the outer (lower) surface, often somewhat glaucous, smooth and shallowly channelled on the inner surface. Panicle 4-12 cm. long, at length much exserted, obliquely ovate, the lower branches often up to 2 cm. apart and up to 8 cm. long, unbranched at the base for about 2 cm. in larger specimens, the spikelets rather numerous, clustered towards the ends of the branchlets, the branchlets and pedicels sparsely scabrous to scabrous-pubescent. Spikelets rather pale-green tinged with purple, 5-7- (rarely 8-) flowered, the group of florets about two-thirds as long as the glumes. Glumes rather narrowly divergent, 11-20 (often about 16) mm. long, unequal, the upper glume usually 1-2 mm. longer than the lower, long acuminate, smooth, about 7-nerved, chartaceous, with broad hyaline margins. Body of the lemma 3-4 mm. long including the 0.75-1 mm. hairy callus, light brown in colour at maturity, smooth and shining, with 2 rows of tufts of hairs, the lower row placed above the callus and consisting of stiff hairs about 1.5-2 mm. long not or scarcely reaching to the upper series, the upper row placed just below the sinus and consisting of hairs 2-4 mm. long; lateral lobes pale coloured, about 6-9 mm. long, flat at the base for about 3-4 mm., 3-nerved, with hyaline margins narrowed obliquely and rather abruptly into delicate setae of about equal length often entwined about the central awn at maturity; central awn about 11-15 mm. long, strong, somewhat reflexed from the base, and again geniculate about 4-6 mm. above the base, the lower part dark-brown and strongly twisted at maturity. Palea much exceeding the sinus by about 2 mm., membraneous-chartaceous, ovate-lanceolate narrowed into a distinctly bilobed tip, glabrous except for the keels minutely ciliolate above, smooth and very shining on the back in the lower part, very narrow between the keels and the margins. Anthers 3, orange-yellow, about 2 mm. long. Fruit obovate, about 2.5 mm. long, the embryo half as long. Fig. 23.

LOCALITIES: *New South Wales:* Narrabri, E. Breakwell, 10.1912 (NSW. 2527); Bathurst, cult., per J. N. Whittet, 1917 (K.); Nangus, Capt. McArthur No. 146, 11.1848 (K.); Canberra, J. Vickery No. K.13, 15.11.1931 (NSW. 1148; K.); Canberra, C.S.I.R. Experimental Plots, F. W. Hely, 28.1.1941 (NSW. 1151, 1152, 1156, 1157); The Glen, Tumbarumba, E. J. McBarron No. 4306, 27.12.1949 (NSW. 10625); 5 miles N of Stockinbingal, F. W. Hely, 17.4.1941 (NSW. 2512); Wagga, comm. J. N. Whittet No. 15 (K.); Gerogery, E. J. McBarron No. 2463, 1.11.1948 (NSW. 6594); Leeton, Rice Research Station, 1940 (NSW. 1158); Urana, per Glenfield Veterinary Research Station, 10.1932 (NSW. 1161, 2528); Urana, W. C. Dugan, 14.10.1939 (NSW. 1162); Henty, E. J. McBarron No. 2538, 11.11.1948 (NSW. 6769), and No. 3234, 13.10.1949 (NSW. 6594); Myall Plans, Berrigan, R. A. O'Neill, 26.10.1935 (NSW. 1164); Holbrook, E. J. McBarron No. 1180, 26.10.1947 (NSW. 4590); Burrumbuttock, E. J. McBarron No. 1233, 6.11.1947 (NSW. 4588); Yanco, G. S. Ridley, 8.1910 (NSW. 1149); Jerilderie district, John Dykes, about 1880 (NSW. 1144, 1160; MEL); Zara, Wanganella (= Wangonilla), E. Officer, 3.1917 (NSW. 1159; MEL.; K.); Tulla (Wakool River district), D. L. W. Henderson No. 142, 29.11.1945, and No. 142a, 3.11.1945, and No. 143, 31.10.1945 (NSW. 2258, 2259, 2260); Barham, J. Vickery, 13.10.1949 (NSW. 10636).

Victoria: Mokoan, R. A. Black, 29.10.1935 (RAB); Taminick, R. A. Black, 29.10.1935 (RAB.); between Echuca and Cohuna, J. Vickery, 12.10.1949 (NSW. 10637); Glenrowan, R. A. Black, 13.10.1935 (RAB.; K.); Wimmera, J. P. Eckert, 1890 (MEL.); Daylesford, R. Wallace, 1878 (MEL.); Benalla, R. A. Black, 24.10.1932 and 30,11.1933 (RAB.); Ravenswood, W. Bissell (MEL.); Broadmeadows, near Melbourne, L. S. Smith, No. M87, 11.1943

(BRI.); St. Albans, A. J. Tadgell, 11.1944 (MEL.); Sandringham, A. J. Tadgell (MEL.); Somerton, P. R. H. St. John, 2.11.1900 (MEL.); Londrigan, R. A. Black, 9.11.1934 (RAB); Rathscar North, R. A. Black, 23.11.1931 (RAB.); Wycheproof district, W. W. Watts, 11-12.1916 (MEL.); Youanmite, R. A. Black, 7.11.1932 (RAB.); Kangaroo Flat, A. J. Tadgell, 11.1934 (MEL.); Melbourne, 1923 (ADW. 380); Kilgobbin, Majorca, Bucknell, 1878 (MEL.).

South Australia: Sandy Creek, Tepper, 9.10.1888 (MEL.); Cult. at Waite Agricultural Research Institute, Adelaide, H. C. Trumble No. Ga 59, Ga 65, and Ga 67, 1930 (MEL.); Cult. at Waite Agricultural Research Institute, Adelaide (NSW. 1202, 1203; K.); without locality, etc., (2 sheets), per Mr. Whittet (MEL.).

A specimen of *D. duttoniana,* viz. "Nangus, 1848, No. 146, N.S.W., Captn. McArthur" was named as *D. semiannularis* by Bentham, but not specifically cited in the Flora Australiensis.

D. duttoniana is a leafy, palatable and nutritious species, and has attracted considerable attention by agronomists for its economic potentialities. Under natural conditions, however, it does not appear to be nearly so abundant as such species as *D. caespitosa* and *D. setacea.*

24. D. procera n. sp.

Gramen perenne, erectum, caespitosum, 70-120 cm. altum; culmi 3-nodi, plus minusve robusti, quam folia longiores, laevi, straminei vel saepe paullo purpurascentes, nodis glabris et interdum nodis inferioribus paullo cereis; vaginae saepe supra tandem laxae, quam internodos breviores, leviter striatae, laevae vel in striationibus leviter scaberulae; ligulae dense ciliatae ciliis 0.5-1 mm. longis; laminae longae, angustae, in sicco involuto-setaceae, tenuiter acuminatae, infra laevae vel plus minusve scabrae, glabraeque, supra canaliculatae, scabrae; panicula valde exserta, in sicco laxe patens, lanceolata vel lineare-lanceolata, 8-15 cm. longa, ramis pedicellisque scabris; spiculae pallidae, aliquanto turgidae, 4-5-flores, flosculis laxe dispositis quam glumas divergentes multo brevioribus praeter aristis exsertis; glumae lanceolatae, aliquanto latae, subaequales vel inferior superiorem paullo excedens, plerumque 14-18 mm. longae, acutae, firmae, paleaceae, manifeste ad bases 5-7-nervatae, microscaberulae, marginibus medioque non manifeste dissimilibus; lemma pallida vel raro tandem fusca, anguste oblongo-fusiformis, in dorso pilorum seriebus duobus distinctis, et inter series pilis paucis diffusis vel raro subglabra, etiam callo piloso, serie inferiore prope supra callum disposita et ad seriem superiorem fere extendente, serie superiore 4-5 mm. longa circa 1 mm. infra sinum disposito; lemmati corpus 4-5 mm. longum 1-2 mm. callum includens, leviter striatum; lobi laterales circa in toto 8 mm. longi, partibus longioribus planis ad setas circa 2 mm. longas tenues acute angustatis vel raro ad coniunctionem minute lobatis; arista firma, breve exserta, circa 15 mm. longa, ad basem fulva contortaque circa 4 mm.; palea firma, 7-8 mm. longa, loborum lateralis partes planas fere aequalans, anguste elliptica, truncata, in dorso subter pilis paucis distantis, in carinis supra minute ciliolata, subter inter carinas marginesque pilis paucis longis; antherae 2-2.5 mm. longae, luteae; caryopsis obovato-triangularis, circa 2.75 x 1.5 mm., fulva.

Holotype: *Tasmania:* Risdon, J. Vickery, 18.1.1949 (NSW. No. 11254).

Tall, erect, densely caespitose perennial, 70-120 cm. high; culms about 3-noded, moderately stout, much exceeding the leaves, smooth, straw-coloured and often finely dotted with purple, the nodes glabrous and often the lower nodes slightly waxy. Sheaths often becoming loose above, shorter than the internodes, lightly striate, smooth, or lightly scaberulous along the striae. Ligule consisting of dense cilia 0.5-1 mm. long. Blades rather long, narrow, inrolled-setaceous on drying, finely pointed, the lower surface smooth to more or less scabrous, glabrous, the upper (inner) surface grooved, scabrous. Panicle much exserted, loosely spreading, lanceolate to linear-lanceolate in outline when dry, 8-15 cm. long, the panicle branches and pedicels scabrous. Spikelets pale coloured, rather turgid, 4-5-flowered, the cluster of florets loosely arranged and much shorter than the divergent glumes except for the shortly exserted awns. Glumes lanceolate, rather broad, subequal or the lower glume slightly longer than the upper, mostly 14-18 mm. long, acute, firm, chaffy, 5-7-nerved at the base, microscaberulous, the margins not sharply differentiated from the central region. Lemma pale, rarely becoming darker at maturity, narrowly oblong-fusiform in outline, with two distinct transverse rows of hairs on the back and a few scattered hairs between the rows or rarely the back sub-glabrous, the callus also hairy, the lower row placed just above the callus and almost reaching to the upper row, the upper row of hairs 4-5 mm. long and placed about 1 mm. below the sinus; body of the lemma 4-5 mm. long including the 1-2 mm. callus, lightly striate; lateral lobes about 8 mm. long in all, the longer flat portion often narrowing rather acutely into the approximately 2 mm. long fine setae, or occasionally minutely lobed at the junction with the setae; central awn rather firm, shortly exserted from the glumes, about 15 mm. long in all, brown and twisted at the base for about 4 mm. Palea firm, 7-8 mm. long, almost equalling the flattened portion of the lateral lobes, narrowly elliptical, truncate, with a few very sparse hairs on the back in the lower part, minutely ciliolate on the keels in the upper two-thirds, and with a few long hairs between the keels and the margins in the lower part; anthers 2-2.5 mm. long, yellow; caryopsis obovate-triangular, broad-shouldered, about 2.75 x 1.5 mm., brown. Fig. 24.

LOCALITIES: *Victoria:* Hamilton to Ballarat, savannah woodland with *Xanthorrhoea*, D. E. Symon, 25.2.1952 (ADW. 6848; NSW. 19399); Tylden, near Woodend, A. Caddy, 29.11.1918 (MEL.).

Tasmania: Risdon, N. T. Burbidge, 18.1.1949 (CAN. No. 3182); Blackman's Bay, L. Rodway, 1.1928 (HO.); Cambridge, D. Martin, 1.1934 (NSW. No. 1345); Mt. Nelson, W. M. Curtis, 29.1.1947 (HO.; NSW. No. 9714); Hobart, L. Rodway, 1.1930 (HO. No. H1162Bb in part); Domain, Hobart, R. A. Black, 12.1909 (RAB.); Lindisfarne, R. A. Black, 30.11.1924 (RAB.); Mt. Stuart and Mt. Wellington, D. Martin, 3.1933 in part (SYD.).

A specimen from New South Wales, Mt. Kosciusko, 4,500 feet, R. Helms, 2.1893 (NSW. 19424) may also be a form of this species.

This species has the coarsely tufted tall habit of *D. pallida* and *D. induta*. It differs from them in that the majority of hairs on the lemma are placed in two transverse rows, and in the firmer texture of the lemma and palea. Of the two it more closely resembles *D. induta*, but differs in the very sparse dorsal hairs, the lower series being distinctly differentiated, the yellow anthers, firmer and less hirsute palea, narrower leaves, broader glumes, more turgid spikelets, shorter panicle, coarser lemma with the lateral lobes usually narrowed more abruptly into the setae. The florets may somewhat resemble those of *D. duttoniana*, especially in the rather abrupt manner in which the lateral lobes narrow into the short setae, but it differs from that species in the narrower looser inflorescence, taller habit, narrower leaves, longer and relatively narrower palea. From certain large-flowered forms of *D. caespitosa* it differs in the loose arrangement of the fewer florets, the very short lateral setae, and taller and more robust habit.

25. D. eriantha Lindl., in Mitchell, Three Exped. Eastern Australia, II (1838), 304.

HOLOTYPE: Interior of New Holland, Major Mitchell's Expedition, 1836, ex herb. Lindley (CGE.).

SYNONYMS: *D. penicillata* F. Muell., Fragm. Phyt. Austral., VIII (1873), 135 pro parte, non Beauv., (1812), non *Arundo penicillata* Labill.; *D. periantha* Brong. et Guillem., Ann. Sc. Nat., 2nd Ser. Bot., XV (1841), 64 in error.

Erect, densely caespitose perennial, 20-70 cm. high. Culms slender, smooth, about 3-noded. Sheaths slender, hirsute with tubercle-based hairs, at length shorter than the internodes. Ligule reduced to cilia, those towards the margins the longer. Blades fine, inrolled-setaceous, rarely somewhat flat, usually more or less hirsute, up to 25 cm. long, shorter than the culms. Panicles at length much exserted, lanceolate to ovate in outline, loosely or rather closely contracted, 2-7 cm. long, bearing about 4-15 spikelets, the panicle branches pubescent to sub-hirsute, often with a few long hairs, especially at the point of branching. Spikelets greenish tinged with purple, 4-6- (rarely up to 8-) flowered, the florets shorter than the glumes. Glumes moderately broad in the lower part, narrowed above the middle into a long acuminate tip, 11-16 mm. ? cm. long, subequal or the lower often slightly exceeding the upper, about 11-13-veined, usually with moderately broad membranous margins. Lemma lanceolate in outline, with a row of hairs at the base about equalling the body of the lemma in length, and a dense row of hairs about 6-7 mm. long just below the sinus, otherwise smooth on the back, shining, more or less indurated, veined, the body of the lemma 3.5-4 mm. long including the 1 mm. callus, rather broad; lateral lobes firm, microscaberulous, broad just above the sinus with distinct membranous margins carried up the sides, narrowing rather quickly into fine setae about 6 mm. long, the whole lateral lobes 2 to 3 times as long as the body of the lemma; central awn 13.15 mm. long, much exceeding the lateral lobes, exserted from the glumes, geniculate, the lower third rather closely twisted and brown, the upper two-thirds fine but firm, straight. Palea rather broad, obovate to oblong or rarely oblanceolate, minutely bifid at the apex or obtuse, minutely ciliolate on the keels at least in the upper part, often hirsute between the keels and the margins, occasionally also with a few hairs on the back, shortly exceeding the sinus, firm, shining. Anthers pale yellow to orange-yellow, 1.5-2 mm. long. Caryopsis obovate, about 2 mm. long. Fig. 25.

LOCALITIES: *New South Wales:* Nyngan, E. Breakwell, 9.1913 (NSW. 800, 2496, 2508); Wellington Valley, Cunningham No. 108, 1825 (K.); Manildra, J. L. Boorman, 11.1906 (NSW. 2491); Pinecliffe, W. F. Blakely, 11.1907 (NSW. 3628); Cargellico, J. L. Boorman, 2.10.1906 (NSW. 2507, 2494; AD.), and 9.1918 (NSW. 2501); Rylestone, D. O. Cross, 26.12.1942 (NSW. 2495); Kiandra to Yarrangobilly, J. Vickery, 12.1.1940 (NSW. 2537); The Glen via Tumbarumba, E. J. McBarron No. 2843, 26.12.1948 (NSW. 7259); Temora to Barmedman, Narramburra and Trungle Hills, J. W. Dwyer, 10.1915 (NSW. 797, 2498, 2509); Wagga, J. N. Whittet No. 10, comm. 1931 (K.); Wagga, J. J. Fletcher (NSW. 795); Griffith, E. N. McKie, 27.10.1938 (NSW. 3629); Ardlethan, J. L. Boorman, 12.1917 (NSW. 798); near White Crystal Mine, Ardlethan, R. H. Cambage No. 4242, 1.10.1916 (NSW. 2504; SYD.); Ardlethan, on quartzite ridge, R. H. Cambage No. 4188, 30.9.1916 (NSW. 2505; SYD.); Hay, J. J. Fletcher, 22.9.1889 (NSW. 2500); Hay district, E. Officer, 9.1903 (NSW. 799); Jerilderie district, Riverina, J. Dykes, about 1880, Nos. 9, 84, 142 (NSW. 2493), and No. 36 in part (NSW. 2497; Deniliquin, W. M. Willoughby, 12.1945 (CAN. 74); Albury, E. Cheel, 10.1928 (NSW. 2490, 2492); Budgingi Trig. Station Hill, E. J. McBarron No. 2554, 10.11.1948 (NSW. 6766); Byrndale, R. A. Black, 28.9.1934 (RAB.); Barham, J. Vickery, 12.10.1949 (NSW. 10641); Tulla Station, Barham, D. L. W. Henderson Nos. 150, 150a, 150b, 10.11.1945 (NSW. 2489, 2487, 2485), No. 150c, 2.11.1945 (NSW. 2486), and No. 150d, 8.10.1945 (NSW. 2488); Cunninyenk, E of Balranald, D. L. W. Henderson No. 155, 19.9.1946 (NSW. 2480), No. 157, 17.9.1946 (NSW. 2481), No. 158, 2.10.1946 (NSW. 2479), Nos. 161, 161a, 161b, 166, 13.10.1946 (NSW. 2484, 2483, 2482, 3468); Wakool River, S of Balranald, J. Vickery, 14.10.1949 (NSW. 10642); Monument Hill, Albury, E. J. McBarron No. 2508, 7.11.1948 (NSW. 6595).

Victoria: Sydenham, A. J. Tadgell (MEL.); Cobberas, F. Mueller, 1877 (K.); Mt. Bogong, A. J. Tadgell, 2.1923 (MEL.); Hume River, S. Jephcott, 1886 (MEL.); Beechworth Road, Leneva, E. J. McBarron No. 2747, 4.12.1948 (NSW. 7191); Eldorado, R. A. Black, 10.11.1934 (RAB.; K.); Wycheproof, W. W. Watts, 9.1917 (NSW. 3630); Jeparit, W. R. Baker, 14.10.1912 (MEL.); Shepparton, Benalla Road, F. W. Britten, 10.10.1935 (K.); Benalla, R. A. Black, 30.11.1933 (RAB.); Benalla, 30.11.1933 (MEL.); Gobur, R. A. Black, 13.12.1933 (RAB.); Gobur, 13.12.1933 (MEL.); Maryvale (MEL.); Kangaroo Flat, A. J. Tadgell, 10.1934 and 11.1934 (MEL.); Whipstick, near Bendigo, A. J. Tadgell (MEL.); Ravenswood, A. J. Tadgell, 11.1935 (MEL.); Yarck, R. A. Black, 14.11.1933 (RAB.); Upper Barwon, B. Wilson, 11.1882 (MEL.); Keilor Plains, A. J. Tadgell, 1932 and 28.9.1944 (MEL.);

Chewton, A. J. Tadgell, 10.1937 (MEL.); Hawkesdale, H. B. W. Williamson, 10-11.1903 (MEL.); Tooma Rapids, Campbell (MEL.); Creswick, J. H. Willis, 12.1929 (MEL.); Grampians, K. Cowle, ca. 1903 (MEL.); St. Albans, comm. E. J. Sonnenberg, 10.10.1930 (K.); Point Lonsdale, G. Weindorfer No. 1617, 11.1903 (MEL.).

South Australia: Wilpena Pound, J. B. Cleland No. H22, 30.4.1930 (K.); Moolooloo near Flinder's Range, E. H. Ising No. 631, 1.10.1918 (K.); Yorke Peninsula, Tepper, 1879 (MEL.).

This species is allied to *D. caespitosa* and *D. auriculata*. From the former it is distinguished by the broader and shorter palea, the typically pilose panicle branches, more ovate inflorescence and broader glumes. From *D. auriculata* it is distinguished by the absence of the characteristic membranous auricles at the base of the lateral lobes, the rather broad membranous margins instead being carried up the outer sides of the lobes as far as the setae; the awns also are usually longer in most specimens of the species, though scarcely so in the Holotype.

In the Flora Australiensis Bentham referred a specimen of *D. eriantha* viz. "Wellington Valley, A. Cunningham" to *D. longifolia*. "Cobberas, F. Mueller, 1877", which he referred to *D. semiannularis,* is also this species.

In southern New South Wales *D. eriantha* is fairly abundant in districts west of the Dividing Range, where it is often associated with *D. caespitosa* and *D. setacea,* and, though probably less common than these two species, may constitute a significant element of the natural pastures and share in their good economic qualities.

26. **D. auriculata** J. M. Black in Trans. & Proc. Roy. Soc. S. Austral., LIII (1929), 261.

LECTOTYPE: *South Australia:* Bundaleer Hills, J. M. Black, 11.11.1927 (JMB.; duplicates at K.; MEL.).

Slender, caespitose perennial, erect, or somewhat geniculate especially at the lower nodes, 15-50 cm. high. Culms smooth, usually much exceeding the leaves, about 3-noded, the nodes glabrous. Sheaths shorter than the internodes, pilose with tubercle-based hairs. Ligule reduced to a ring of short cilia about 0.5 mm. long, often pilose with longer hairs at the sides. Blades usually rather short, 2-10 cm. long, fine, inrolled, or occasionally flat and about 2 mm. wide, more or less densely pilose. Panicle much exserted, obliquely ovate in outline, short, often about 4 x 2.5 cm., compact but the spikelets not numerous, sometimes reduced almost to a raceme, the branches and pedicels short, pilose on their inner sides. Spikelets about 6-flowered, the group of florets much shorter than the glumes except for the tips of the awns, pale greenish tinged with purple, at length straw-coloured. Glumes 9-16 mm. long, the upper usually 1-2 mm. longer than the lower, lanceolate, slightly swollen below, cymbiform, often slightly keeled in the upper part, narrowed above the middle into an acuminate or acute tip, 9-11-nerved, with a distinct membranous margin, smooth or microscaberulous on the sides of the nerves. Body of the lemma 3.5-4 mm. long including the 0.5-1 mm. callus, about 2 mm. broad, glabrous, smooth and shining on the back except for a row of tufts of hairs 1-2.5 mm. long near the base, and a row of tufts of hairs 5-6 mm. long just below the sinus, the callus also hairy, the hairs all stiffly spreading at maturity, the body pale straw-coloured, about 9-nerved, the nerves obscure; lateral lobes about 11-12 mm. long in all, firm, 3-nerved, microscaberulous along the margins, narrowing acuminately within about 4 mm. into long setae, the membranous outer margins terminating abruptly in a triangular, acute or obtuse, membranous lobe or auricle, rarely the auricles much reduced in size; central awn shortly exceeding the lateral lobes, at maturity more or less twisted and often brown below the joint, pale and flexuose above. Palea shortly exceeding the sinus, oblong to broadly oblanceolate or obovate, obtusely truncate or minutely bifid, minutely ciliolate along the keels, pilose on the back and with long, scattered hairs between the keels and the margins. Anthers linear, about 1.5-2 mm. long. Ovary obovate. Fruit obovate-cuneate, 2 mm. long, the embryo a little more than half as long. Fig. 26.

LOCALITIES: *New South Wales:* Dubbo, J. B. Cleland (NSW. 1320; AD.); Molong, J. B. Cleland, 10.1913 (NSW. 1317); Canowindra, R. Garden, 8.10.1949 (NSW. 10648); Wyalong, J. L. Boorman, 10.1903 (NSW. 1294); Wyalong, E. Breakwell, ca. 1913 (NSW. 1292); Kildary, W. R. Baker, 6.10.1917 (MEL.); Temora district, W. C. Duggan, on red loam of granitic origin, 21.11.1939 (NSW. 1275); Narramburra and Trungle Hills, Temora, J. W. Dwyer, 10.1915 (NSW. 1295, 1305); Temora, H. Elliott No. 1912 (NSW. 1304); Cootamundra, per Glenfield Veterinary Research Station, 5.10.1932 (NSW. 1311); Griffith, F. W. Hely, 6.11.1941 (NSW. 1313); Burrowa, T. Patterson, 11.1911 (NSW. 1321); Demondrille, E. Cheel, 13.11.1925 (NSW. 1319); Braidwood, E. Cheel, 10.1932 (NSW. 1318); Goulburn, L. G. Kaleski, 26.11.1939 (NSW. 1276); Canberra, W. Hartley, 3.11.1930 (CAN.); Canberra, R. H. Cambage, 3.11.1919 (NSW. 1290; SYD.); Canberra, J. Vickery, 1.11.1931 (NSW. 1277, 1314; SYD.); Captain's Flat, H. Gibson, 5.1.1938 (NSW. 1299); Humula district, on light sandy soils of granitic origin, W. C. Duggan, 25.11.1939 (NSW. 1302); Young, J. B. Cleland, 11.1915 (NSW. 1291); Griffith, E. N. McKie, 27.10.1938 (NSW. 2533); Jerilderie district, J. Dykes No. 36 in part, ca. 1880 (NSW. 1278); on the plains, Culcairn to Germanton (Holbrook), W. Forsyth, 11.1900 (NSW. 1288, 1316); Holbrook, E. Breakwell, ca. 1913 (NSW. 1297); Yanco, E. Breakwell, ca. 1913 (NSW. 1289, 1306); Pleasant Hills (MEL.).

Victoria: Peechelba, comm. E. J. Sonnenberg, 11.1935 (K.); Youanmite, R. A. Black, 7.11.1932 (RAB); Shepparton, R. A. Black, 21.10.1932 (RAB.); Strathbogie Ranges, W. Gates, 1891 (MEL.); Gobur, 13.11.1933 (MEL.); Wimmera, Dallachy (MEL.); Castlemaine, A. J. Tadgell, 10.1932 (MEL.); Toolern Vale, A. J. Tadgell, 10.1940 (MEL.).

South Australia: Jamestown, J. M. Black (K., Syntype); Waite Institute, Adelaide, C. M. Eardley, 10.11.1931 (ADW. 367); Beaumont Common, Adelaide, J. B. Cleland, 18.10.1928 (JBC.) and 2.11.1931 (JBC.; K); Barossa Reservoir, J. B. Cleland, 22.11.1939 (JBC.; NSW. 1286); Millbrook, J. B. Cleland, 25.10.1924 (JBC.; NSW. 1287); Millbrook (ADW. 366); National Park, O. E. Menzel 10.1897 (AD.); National Park, J. B. Cleland, 29.9.1935 and 20.10.1935 (JBC.); Morialta, J. B. Cleland, 2.11.1935 (JBC.); Cherry Gardens, J. B. Cleland, 18.11.1944 (JBC.); Mt. Barker, F. Liebelt, Spring 1938 (ADW. 3711); Hull's Creek, Encounter Bay, J. B. Cleland, 16.11.1930 (JBC.; NSW. 1285; K.); Hillside Bluff, Encounter Bay, J. B. Cleland, 15.11.1930 (JBC.; K.).

D. auriculata, though a rather slender species, forms a significant element in natural pastures on the central and southern tablelands and slopes and nearer western plains in New South Wales, and is hence of some considerable economic importance. It is also abundant in parts of Victoria and South Australia. Its closest affinity is certainly with *D. eriantha.*

27. D. laevis J. Vickery in Contrib. N.S.W. Nat. Herb., I, No. 5 (1950), 299.

HOLOTYPE: *Australian Capital Territory:* Base of Mt. Stromlo, A. Melvaine, 26.4.1941 (NSW. 3232).

Erect, densely caespitose perennial, 20-60 cm. high. Culms 2-4-noded, slender, smooth except sometimes slightly scabrous below the panicle. Sheaths glabrous or hisute, enfolding the culms or the lower often loose. Ligule reduced to short cilia, the margins long ciliate, sometimes also ciliate across the collar. Blades usually fine, inrolled setaceous, somewhat rigid, pointed, or sometimes flat at the base and up to 1.5 mm. wide, up to 20 cm. long, glabrous or hirsute, the tubercle-based hairs often somewhat appressed. Panicle much exserted above the leaves, usually contracted, short, about 3-4 cm. long, loosely racemose or paniculate, bearing about 5-20 spikelets, the pedicels finely scaberulous-pubescent to loosely pilose. Spikelets greenish tinted with purple, 4-6-flowered, the florets rather divergent, shorter than the glumes except for the shortly or rather long exserted awns. Glumes moderately narrow, or somewhat broad in the lower part, faintly cymbiform, with a rather narrow membranous margin, narrowing acuminately, 11-18 mm. long, subequal or the upper glume longer than the lower, rather firm, usually 5-7-veined. Lemma lanceolate to narrow-lanceolate-fusiform in outline, with a dense row of rather long hairs (4-7 mm.) just below the sinus and rather dense tufts on the margins just above the callus, otherwise very smooth and shining on the back and lacking the lower row of hairs, the body of the lemma about 4-5 mm. long including the 1 mm. hairy callus, thinly indurated; lateral lobes twice as long as the body of the lemma, often fairly broad at the base with broad, membranous, microscaberulous margins, narrowing upwards into fine setae 2-4 mm. long; central awn much exceeding the lateral lobes, about 11-28 mm. long, light-brown and once or twice loosely twisted below the bend, the upper part nearly three times as long as the lower, moderately rigid. Palea slightly to much exceeding the sinus, often about 5 mm. long, lanceolate to oblanceolate or occasionally almost obovate in outline, truncate or minutely bifid, minutely ciliolate on the keels in the upper part, otherwise glabrous, rather firm. Anthers yellow, 1.5-2 mm. long. Caryopsis obovate, about 2.5 mm. long. Fig. 27.

LOCALITIES: *New South Wales:* Grafton district, per Glenfield Veterinary Research Station, 22.1.1940 (NSW. 3236); Moredun Creek, 25 miles NW of Guyra, E. N. McKie No. 2023, 24.12.1930 (ADW. 413); St. Helena Gully, Wollomombi, 21 miles E of Armidale, E. N. McKie No. 2012a, 26.11.1932 (ADW. 414); Tangley, E. N. McKie, 20.12.1947 (NSW. 7458); Armidale, D. O. Cross, 1937 (NSW. 3234); Rylestone, D. O. Cross, 7.3.1941 (NSW. 3238); Mt. Werong, R. H. Cambage No. 3181, 4.12.1911 (NSW. 3239; SYD.); Mossvale, M. E. Phillips, 1.1947 (NSW. 3233); Oberon, J. Vickery, 18.12.1949 (NSW. 10622) and 26.1.1953 (NSW. 21865); Salisbury Plain, R. Roe No. 579, 580, 22.2.1945 (CAN.); Canberra, in C.S.I.R. Experimental Plots, F. W. Hely, 1.1941 (NSW. 3638); Manten via Yass, E. Webb, 15.11.1938 (NSW. 3240); Badja, A. B. Costin, 1.3.1949 (NSW. 7646); between Nimmitybelle and Brown Mountain, A. B. Costin, 25.1.1949 (NSW. 7645).

Victoria: Rocky Plain, Cobberas area, 4,200 feet, N.A. Wakefield No. 2918, 28.1.1949 (NSW. 7330); Black Mountain Station, Little River, 2,800 feet, N. A. Wakefield No. 2619, 13.1.1949 (NSW. 7335); Hawkesdale, near Hopkin's River, H. B. Williamson No. 3, 1893 (MEL.); between Melbourne and Tooradin, on roadside in damp sandy places, S. T. Blake No. 7271, 2.1935 (BRI.; NSW. 3923); Alexandra, 11.11.1933 (MEL.); Silvan, A. J. Tadgell, 11.1933 (MEL.); Yarra Junction, A. J. Tadgell, 12.1936 (MEL.).

Tasmania: Van Diemen's Land, ex herb. Lehmann, from Lindley (CGE.); Archer (NSW. 4385); R. C. Gunn (CGE., in respect to one of the species on the sheet); Penquite, Gunn No. 1454, 9.12.1844 (NSW. 4388); Woodburn near Richmond, Oldfield No. 83 (K., in respect to one of the species on the sheet); Marlboro', Gunn, 8.1.1841 (K.); The Steppes, R. A. Black, 28.1.1949 (RAB.; NSW. 10792); Mt. Nelson, W. M. Curtis, 21.9.1947 (HO.; NSW. 9710); between Derwent Bridge and Bronte, N. T. Burbidge, 27.1.1949 (CAN. 3400); River Dee on Lyell Highway, J. Vickery, 19.1.1949 (NSW. 7469); Strahan, J. Vickery, 22.1.1949 (NSW. 7466).

South Australia: Mt. Barker, F. Liebelt, June 1936, No. 4 (ADW.); Outer Harbour, J. B. Cleland, 22.10.1932 (JBC.; NSW. 3937); Morialta, J. Vickery, 11.1938 (NSW. 3235).

This species resembles *D. eriantha* and *D. caespitosa* in habit and floral characteristics, but may be readily distinguished from either by the absence of the lower row of hairs across the back of the lemma.

A specimen at Kew was named *D. setacea* by Hooker (vide FL. Tas., II (1860), 121) and as *D. semiannularis* by Bentham.

D. laevis has as yet been insufficiently collected to enable its abundance and significance to be assessed. Its superficial resemblance to other abundant species has apparently resulted in its collection having been accidental rather than intentional, and several of the above specimens have been separated from mixed collections. I have observed that it is not uncommon in some pastures in Tasmania and in some localities in the Central Tablelands of N.S.W.

28. D. pilosa R. Br., Prod. (1810), 177.

HOLOTYPE: *New South Wales:* Port Jackson, R. Brown, Iter Australiense, 1802-5, No. 6234 (BM.; duplicates at K.; MEL.).

SYNONYMS: *D. gunniana* Nees in Hook. Lond. Journ. Bot., II (1843), 416; *D. penicillata* F. Muell., Fragm. Phyt. Austral., VIII (1873), 135 pro parte, non Beauv. (1812), non *Arundo penicillata* Labill.; *D. penicillata* var. *pilosa* Maiden & Betche, Census of N.S.W. Pl., (1916), 22 (incorrectly ascribed there to F. Muell.).

Figured in Trinius, Spec. Gram., I (1821), t. 51 (in the copy of this work in the library of the National Herbarium of N.S.W. this figure is in vol. III, t. 315). The plant figured by Bacchus in Ann. Rep. Agric. Victoria, II (1874), t. 10 above the name *D. racemosa* seems to resemble *D. pilosa* R. Br. more closely than does his figure above the name *D. pilosa* on the same plate; absence of detailed drawings of dissected spikelets prevents any definite conclusion. The New Zealand plant illustrated in Buchanan, Man. Indig. Grasses New Zeal., (1880) pl. 33 and 33 (2) A, and in Jour. New Zeal. Dept. Agric., VIII (1914), 247, 625, and XIII (1916), 353 appears to agree with the Australian species.

Erect or very slightly geniculate, slender, caespitose perennial, up to 50 cm. high. Culms much exceeding the leaves, finely striate, 3-5-noded, the nodes glabrous. Sheaths more or less pilose with tubercle-based hairs, striate, sometimes becoming somewhat loose above, shorter than the internodes. Ligule reduced to a shortly ciliolate rim, or sometimes ciliate, with longer cilia at the sides and sometimes a ring of hairs at the back of the collar. Blades flat, up to 2 mm. wide, or more commonly loosely inrolled on drying, pilose, up to 12 cm. long. Panicle exserted, 4-5 cm. long, sometimes almost racemose, but the spikelets crowded and much overlapping, the panicle branches scabrous-pubescent, sometimes pilose on one side. Spikelets 7-9- (rarely 6-)flowered, usually straw-coloured, the group of florets closely packed, sometimes more or less equalling but seldom exceeding the glumes except for the long-exserted central awns. Glumes 9-13 mm. long, moderately narrow, comparatively straight, somewhat keeled especially in the upper part, only narrowly divergent, subequal or the upper glume often slightly exceeding the lower, the lower glume 5-7-nerved, the upper 5-nerved, scaberulous on the nerves, with distinct membranous margins, narrowing evenly into the acuminate tips. Lemma narrow-fusiform, the body about 4-6 mm. long including the 0.75-1 mm. hairy callus, glabrous except for a row of hairs above the callus and two marginal and two dorsal tufts placed about 1.5 mm. below the sinus, the dorsal tufts sometimes absent, firm, shining, faintly 9-nerved; lateral lobes narrow, firm, the membranous margins typically rather narrow and inconspicuous, tapering evenly within 2-4 mm. into awns 6-8 mm. long, the whole lobe about 8-11 mm. long; central awn usually exceeding the laterals by about 5 mm. or sometimes more, twisted and golden-brown below the joint for about 4 mm. Palea only shortly exceeding the sinus, about 3.5-4 mm. x 1.25-1.5 mm., oblanceolate, minutely bifid at the apex, minutely ciliolate on the keels, glabrous on the back or with a few cilia near the base and very few between the keels and the margins. Anthers 3, pale, about 1 mm. long. Fig. 28.

LOCALITIES: *Queensland:* Stanthorpe, B. Scortechini, 12.1887 (NSW. 1808).

New South Wales: Sieber, Agrostotheca No. 57 (MEL.; K.); Glen Innes, E. Cheel, 8.12.1924 (NSW. 1799, 1880); Kelso, 29 miles NW of Guyra, E. N. McKie No. 2022, 6.1.1932 (NSW. 9366; ADW. 390); Wandsworth, 15½ miles NW of Guyra, E. N. McKie No. 2011, 31.12.1931 (NSW. 9368; ADW. 388); 5 miles W of Ben Lomond, 4,200 feet, E. N. McKie, No. 2010, 18.12.1931 (NSW. 9369); Black Gully, Guyra district, E. N. McKie, 29.12.1947 (NSW. 7461); Guyra, E. N. McKie No. 2027, 14.12.1933 (NSW. 9370; ADW. 389), a form with dark purple glumes and purplish tinted lemmas; Guyra, C. T. White No. 10290, 28.12.1935 (MEL.); 5 miles S of Guyra near Little Lagoon, E. N. McKie No. 641, 5.12.1930 (BRI.; K.); Rosehill, 5 miles SW of Guyra, E. N. McKie No. 2481, 14.1.1932 (NSW. 3241); 7 miles from Guyra on Tinga road, 4,100 feet, E. N. McKie No. 639, 28.12.1930 (BRI.; K.); Elderbury Creek, 6½ miles SSW of Guyra, 4,200 feet, E. N. McKie No. 2002 (No. 713 in Herb. Kew), 15.12.1931 (NSW. 9367; MEL.; K.), and No. 2018, 1.1.1933 (NSW. 9365; ADW. 386); Dingo Creek, 5 miles E of Guyra, E. N. McKie No. 640, 23.11.1930 (BRI.); Armidale district, C. K. Ingram, 12.1938 (NSW. 1814); Walcha district, J. H. Maiden, 11.1897 (NSW. 1813); between Gulgong and Coolah, M. V. O'Reilly, 27.11.1939 (NSW. 1806); Mudgee, Shire Clerk, 1.3.1940 (NSW. 1809); Rydal, G. B. Vickery, 13.1.1934 (NSW. 1816; SYD.; K. 17); Blackheath, J. H. Maiden, 1.1907 (NSW. 4035); Blue Mountains, J. L. Boorman, 1.1907 (AD.); Leura, A. A. Hamilton, 12.1910 (NSW. 1805); Wahroonga, W. F. Blakely, 30.10.1913 (NSW. 1825); Parramatta River, J. L. Boorman, 11.1914 (NSW. 1826); Ryde, H. Deane, 11.1884 (NSW. 1824); Parramatta, Woolls (MEL.); Glenfield, E. Cheel, 19.11.1924 (NSW. 1804); Glenfield, Seddon, 1924 (NSW. 1822); 3 miles E of Leumeah, L. Johnson, 6.11.1948 (NSW. 6596); Hurstville, H. Deane, 11.1885 (NSW. 1823); Mittagong, E. N. McKie, 21.11.1941 (NSW. 1811); Oberon, J. Vickery, 18.12.1949 (NSW. 10623); Canberra, L. Pryor, 12.1937 (NSW. 1818); Humula district, W. C. Duggan, 25.11.1939 (NSW. 1815); Laurel Hill, 8 miles NE of Tumbarumba, 3,000-3,300 feet, E. J. McBarron No. 2848, 27.12.1949 (NSW. 7261); between Wee Jasper and Tumut, J. Vickery, 8.1.1940 (NSW. 1820); Kosciusko, 4,500-5,000 feet, J. Calvert and W. Hartley, 1930 (CAN.).

Victoria: Mt. Stanley, ca. 3,300 feet, E. J. McBarron No. 2913, 3.1.1949 (NSW. 7263); Beechworth, A. Meebold No. 21592, 11.1936 (NSW. 1807); Delegate River ca. 3,000 feet, J. H. Willis, 17.1.1948 (MEL.); Black Creek near Skipton, Whan (MEL.); Dandenong Range below Kalorama, L. S. Smith No. M2, 24.1.1943 (BRI.); Gobur, R. A. Black, 13.11.1933 (RAB.); River Yarra, in hilly meadows, F. Mueller, 11.1852 (MEL.); Hawkesdale, H. B. Williamson, 11.1899 (MEL.); between Bendoc and Lower Bendoc School, J. H. Willis, 20.1.1948 (MEL.).

Tasmania: Insula Van Diemen, R. Gunn No. 998 (CGE., Type of *D. gunniana* Nees); C. Stuart (K., in part); Archer (NSW. 1828); Gunn No. 585, 1852 (K.); L. Rodway No. 1009c, 4 sheets (HO.); Launceston, Gunn No. 998 in part, 13.11.1941 (K.); Port Dalrymple, R. Brown per Colonel Paterson (K.; MEL.); Recherche Bay, No. 1455, 1838, in herb. Hooker (K.); Lake St. Clair, J. Vickery, 19.1.1949 (NSW. 7478); Swanport, Storey (MEL.); 1 mile E of Westerway, N. T. Burbridge, 21.1.1949 (CAN. 3228); 4 miles SE of Scotsdale, N. T Burbidge, 9.1.1949 (CAN. 3029); River Dee on Lyell Highway, J. Vickery, 19.1.1949 (NSW. 7470); New Norfolk, Gunn No. 998 in part, 15.12.1840 (NSW. 1829, 1830; K.); Hobart, L. Rodway No. 1162c, 12.1928 (HO.); Hobart Town, Gunn No. 998 in part, 14.12.1840 (NSW. 1827); Sandy Bay, Hobart, on sandy flat behind beach, W. M. Curtis, 12.1943 (HO.); Southport, Stuart (MEL.); Lindesfarne, 200 feet, D. Martin, 4.1933 (SYD.); Lindesfarne, R. A. Black, 30.11.1924 (RAB.); Copping, J. Vickery, 15.1.1949 (NSW. 7474); 10 miles W of Copping, J. Vickery, 15.1.1949 (NSW. 7490); Tasman Arch, Eaglehawk Neck, J. Vickery, 15.1.1949 (NSW. 7463).

South Australia: Adelaide, M. Koch No. 922, 11.1902 (NSW. 1801); Kuitpo, J. B. Cleland, 11.1922 (JBC.; NSW. 1802); Waterfall Gully, J. B. Cleland No. H557 and H558, 28.11.1931 (JBC.; NSW. 4047, 4048); National Park, J. B. Cleland, 20.10.1935 (JBC.); National Park, O. E. Menzel, 10.1897 (AD.); Morialta, J. B. Cleland, 2.11.1935 (JBC.); Basket Range, C. M. Eardley, 8.12.1934 (ADW. 423); Mt. Barker, F. Liebelt No. 10, Spring 1938 (ADW. 3714); Mylor, J. F. Bailey, 26.11.1930 (K.).

Western Australia: Warren River, Walcott (MEL.); Karri Dale, P. Walcott, 12.1867 (MEL.); Nannup via Balingup, A. McKettrick, 1.1909 (K.); Bremer Bay, J. Wellstead, 1900 (K.).

Also occurs in New Zealand.

28a. Var. paleacea n. var.

Ab typo habito robustiore usque 90 cm. alto rigidiore, laminis latioribus aliquandum subglabris, arista valida base tortili fusca quam lobos laterales ca. 10 mm. longiore, lobis lateralibus longioribus, lemmate latiore, glumis 10-20 mm. longis latioribus marginibus manifestioribus paleaceis differt.

HOLOTYPE: *Western Australia:* Busselton, F. Stoward, 11.1911 (NSW. 1831; duplicate at K.).

Differs from the Type in the often more robust, rigid habit up to 90 cm. in height, broader leaves from hirsute to subglabrous; central awn of the lemma strong, exceeding the lateral lobes by up to 10 mm., the lower portion dark and twisted; lateral lobes longer; body of the lemma rather broader; glumes 13-20 mm. long, broader with more conspicuous chaffy margins; inflorescence dense, crowded.

Localities: *Victoria:* Upper Murray, Findlay, 1833 (MEL.).

South Australia: Basket Range, J. F. Bailey, 29.11.1930 (K.); Waterfall Gully, quartzite hillside, J. B. Cleland No. H557, 28.11.1931 (K.); National Park, J. B. Cleland, 29.9.1935 (JBC.; NSW. 4049); Morialta, J. B. Cleland, 11.1936 (JBC.); Forest Range to Carey's Gully, J. B. Cleland, 18.12.1943 (JBC.; NSW. 4209); Mt. Barker, F. Liebelt, Spring 1938 (ADW 3723); Aldgate, F. S. Salisbury, 16.11.1911 (CGE.).

Western Australia: Without exact locality, Preiss, 1859 (MEL.); Wooroloo, M. Koch No. 1826, 11.1907 (K.; NSW. 4399); Drakesbrook, in herb. A. Morrison, 29.11.1898 (K.); Dennybrook, W. M. Carne, 28.11.1923 (PERTH); Darling Ranges, Koch No. 1784, 11.1907 (NSW. 1833); Darling Ranges, W. V. Fitzgerald, 11.1902 (NSW. 4397); Araluen, Darling Range, N. T. Burbidge, 9.12.1951 (CAN. 3644, 3643); Smith's Hill, near Perth, Darling Range, ex herb. Cecil Andrews No. 1210, 8.11.1902 (K.); Harvey, F. Stoward, 12.1916 (PERTH); K.); Darlington, Darling Ranges, A. Morrison, 2.11.1905 (K.); Wallcliff, Bussell (MEL.); Swan River, Drummond, 1839 (K.); Swan River, Drummond, ex herb. Lemann (CGE.); Warren River, Walcott (K.); Blackwood River, Walcott (MEL.); Disellingup, F. Stoward, 11.1914 (NSW. 1832); Roelands, R. Rose, 11.1905 (PERTH); on banks of Swan River, 2-4 miles above Northam, H. Salasoo No. 153, 8.10.1949 (NSW. 15839); Wungong Gorge near Armadale, S. T. Blake No. 18020, 24.8.1947 (BRI.).

In his description of *D. gunniana,* Nees cites the Type as "In Insula Van Diemen, d.1. jan. 1838, Gunn N.994". The specimen at Cambridge from Lindley's herbarium which bears the name *Danthonia gunniana* in Nees' handwriting is annotated "No. 998, Insula Van Diemen, R. Gunn." The figure "8" is however rather ill-defined, and in spite of the discrepancy there is little doubt that this sheet is the Type. It represents normal *D. pilosa* R.Br.

I have seen almost all the specimens cited under *D. pilosa* by Bentham in the Flora Australiensis, and they are all referable to that species or to var. *paleacea.*

The type form of *D. pilosa* is abundant on the coast and tablelands of N.S.W. and in Tasmania, and extends also to South and Western Australia. Towards the western part of the continent the var. *paleacea* appears to become more prevalent, while in South Australia forms somewhat intermediate between the type and varietal forms are not uncommon. It is to be hoped that future genetic and ecological studies with throw further light on the relationships between the species and variety.

On the one hand *D. pilosa* appears to be related to *D. caespitosa* from which it differs somewhat in shape of the palea but most conspicuously in the reduction of the upper row of hair-tufts on the lemma to marginal and dorsal tufts. However occasional specimens are found with an intermediate degree of suppression of these hair-tufts, and not typical of the condition usually found in either species. On the other hand *D. pilosa* is closely related to *D. penicillata, D. racemosa* and *D. nudiflora,* but differs from all three when well developed in its rather short contracted panicle. It may often be difficult to discriminate between stunted specimens. From *D. racemosa* it further differs in its shorter callus, and the glumes exceeding the florets, and from *D. nudiflora* in its softer, thinner and usually pilose leaves.

The New Zealand specimens referred to *D. pilosa* which I have examined are often rather puzzling and appear to combine some of the characters of *D. pilosa* and *D. racemosa.*

D. pilosa is a useful constituent of pastures on the coast and tablelands of N.S.W.

29. **D. penicillata** (Labill.) Beauv., Agrost., (1812), 92, 153, 160.

Holotype: *Tasmania:* Nova Hollandia et Terra Van Diemen, Labillardière (Bot. Mus., Florence). Dr. Pichi-Sermolli kindly forwarded from Florence a photograph of the Type sheet, and sent on loan a spikelet, enabling the identity of this species to be definitely established.

SYNONYMS: *Arundo penicillata* Labill., Pl. Nov. Holl., I (1804), 26, t. 34; *Danthonia penicillata* (Labill.) F. Muell., Fragm. Phyt. Austral., VIII (1873), 135 excluding synonymy; *D. racemosa* var. *penicillata* (Labill.) Benth., Fl. Austral., VIII (1878), 594.

Somewhat straggling, loosely caespitose, ascending perennial, often geniculate at the nodes especially below, 35-75 cm. high. Culms very slender, 3-4-noded, the nodes glabrous, finely striate, pubescent below the panicles. Sheaths sub-glabrous to sparsely hirsute, finely striate, often minutely scabrous on the sides of the veins, shorter than the internodes, sometimes loose above. Ligule reduced to a minute jagged rim, sometimes more or less divided into very short hairs, sometimes pilose at the sides and rarely with a ring of hairs around the back of the collar. Blades narrow, flat and up to 2 mm. wide, or more frequently finely inrolled and filiform, up to 15 cm. long, rather thin, more or less hirsute with short sparse hairs. Inflorescence sub-racemose, linear, not crowded, 5-10 cm. long, not rigid, much exserted, the rhachis and short pedicels finely pubescent. Spikelets often purplish, 4-6-flowered, rarely up to 7-flowered, the group of florets closely cohering and usually shorter than the glumes, rarely exceeding them, except for the exserted awns. Glumes subequal, 10-12 mm. long, of moderate width, slightly cymbiform, usually enclosing the florets, narrowing above the middle into acute or acuminate tips, firm, with only narrow membranous margins, striate, the lower glume about 9-nerved, the upper glume 5-nerved. Lemma narrow-fusiform in outline, glabrous except for lateral tufts of hairs just above the callus and about 1 mm. below the level of the sinus, the hairs 1-2 mm. long, sometimes also with dorsal tufts, the lower series of tufts sometimes more or less forming a loose row, the callus also hairy, the body of the lemma smooth, shining, lightly striate, 9-veined, about 4 mm. long including the 1 mm. callus; lateral lobes with membranous margins, tapering into fine awns about as long as the lower expanded portion, the whole lobes about 7-8 mm. long, sometimes shorter; central awn twisted and brown below the joint, exceeding the lateral lobes by about 4 mm. (sometimes the whole lemma smaller by one-quarter than the dimensions given). Palea much exceeding the sinus, 4-4.5 x 1-1.25 mm., linear-lanceolate, bifid or narrowly truncate, glabrous on the back, very minutely and obscurely ciliolate along the keels, glabrous between the keels and the margins. Anthers about 0.75 mm. long. Fruit oblanceolate, about 2.25 x 1 mm., the embryo about 0.75 mm., convex on one side, slightly concave on the other. Fig. 29.

LOCALITIES: *New South Wales:* Mt. Kosciusko, R. Helms, 2.1893 (NSW. 4027); between Island Bend and Hotel, Mt. Kosciusko, N. T. Burbidge, 25.2.1952 (CAN. 3784); Southern Slopes of Black Mountain, Canberra, W. Hartley, 11.1930 (CAN.); near Mt. Franklin, ca. 5,000 feet, S. T. Blake, No. 13886, 19.1.1939 (BRI.); Mt. Franklin, 5,600 feet, N. T. Burbidge, 6.2.1947 (CAN.); Wee Jasper, at high altitude, J. Vickery, 8.1.1940 (NSW. 3250); Laurel Hill, 8 miles NE of Tumbarumba at 3,000-3,300 feet, E. J. McBarron No. 2870, 27.12.1948 (NSW. 7262); Norway, near Oberon, J. Vickery, 26.1.1953 (NSW. 21864).

Victoria: Bidwell, on the grasslands of the open forest, W. Hunter, 2.1943 (MEL.); Mt. Buffalo, ca. 4,500 feet, S. T. Blake No. 7328, 25.1.193~~4~~5 (BRI.; MEL.), and No. 7329, 25.1.1935 (BRI.; NSW. 3466); Acheron Way, A. J. Tadgell, 10.1937 (MEL.); Acheron, Dandenong Ranges, J. Vickery, 19.1.1935 (NSW. 3242; K.); Warburton, ca. 500 feet, S. T. Blake No. 7218, 19.1.1935 (BRI.; NSW. 3248); near Kallista, Dandenong Range, S. T. Blake No. 7304, 22.1.1935 (BRI.; NSW. 3247); West King Lake, A. J. Tadgell, 12.1926 (MEL.); Ringwood, A. J. Tadgell, 4.1935 (MEL.); Yarra Junction, A. J. Tadgell, 12.1936 (MEL.); Silvan, A. J. Tadgell, 12.1920 (MEL.); Boronia, A. J. Tadgell, 3.1931 (MEL.); Ballarat, W. H. Bacchus (MEL.; K.); Poowong Road, A. W. Howitt, 1888 (MEL.); Fainting Range, F. Mueller, 2.1859 (MEL.); Foster, F.C.W.B. (H. B. Williamson collection), 10.1925 (MEL.).

Tasmania: Van Diemen's Land, ex herb. Lemann, from Lindley (CGE.); L. Rodway No. 1009b (HO.); Archer No. 245 in part (NSW. 3243); J. Milligan No. 200 (HO.); Distillery Creek near Launceston, E. Oakden, 12.1.1888 (MEL.); Miena, Great Lake, R. A. Black, 27.1.1948 (RAB.); Russell Falls, J. Vickery, 16.1.1949 (NSW. 7477); Hobart, L. Rodway, 1.1930 (HO.); Leenah Valley, Mt. Wellington, 800 feet, D. Martin, 31.1.1938 (NSW. 3251); Mountain River, D. Martin, 30.3.1941 (NSW. 3245, 3246); Huonville, D. Martin (CAN. 13172); Sawpits, L. Rodway, 4.1892 (HO.); near Linda, R. A. Black, 8.1.1915 (RAB.);

Blackman's Bay, C. Barnard, 1.1928 (HO.); Southport, C. Stuart, 1.1856 (MEL.; K.); Recherche Bay, No. 1559 (MEL.); Dover, W. M. Curtis, 9.1.1947 (HO.; NSW. 9705); 5 miles N of Port Arthur, J. Vickery, 15.1.1949 (NSW. 7471, 7479).

In the Flora Australiensis Bentham referred the specimen (mentioned above) from "Southport, C. Stuart" to *D. racemosa* var. *biaristata*. The specimen "Tasmania, C. Stuart, herb. F. Mueller, 1877" which he referred to var. *penicillata* appears to me to be in part *D. pilosa* and in part *D. racemosa*. I have not seen the other specimens which he referred to var. *penicillata*.

D. penicillata is very closely related to *D. pilosa*, having a very similar spikelet and floret structure, and it is with some hesitation that I have retained them as distinct. In Tasmania, however, *D. penicillata* is not uncommon in sheltered forest areas, and is a lax, only semi-erect plant with a slender soft raceme. *D. pilosa* is more stiffly erect in habit, and the panicle more branched and contracted, while the spikelets tend to have more numerous florets and more strongly exserted awns; it is characteristic of more open country pastures. Well grown plants can generally be readily distinguished, but more stunted plants (as represented by many herbarium specimens) are often difficult to place with confidence. The possibility remains that the two are ecotypes, and further field work is necessary to establish their relationships. I have examined several (rather inadequate) specimens from the northern tablelands of N.S.W. which I could not refer with confidence to the one rather than to the other species. The Tasmanian specimens cited above agree well with the Holotype.

30. **D. racemosa** R.Br., Prod., (1810), 177.

HOLOTYPE: *New South Wales*: Port Jackson, R. Brown, Iter Australiense 1802-5, No. 6235 (BM.; duplicates at K.; MEL., fragment only).

SYNONYMS: *D. racemosa* var. *biaristata* Benth., Fl. Austral., VII (1878), 594; *D. penicillata* F. Muell., Fragm. Phyt. Austral., VIII (1873), 135 pro parte non Beauv. (1812), non *Arundo penicillata* Labill.; *D. penicillata* var. *racemosa* Maiden & Betche, Census of N.S.W. Pl., (1916), 22 (incorrectly ascribed there to F. Mueller).

Variable, erect, rather slender, caespitose perennial, usually 20-60 cm. high. Culms slender, glabrous, smooth, sometimes faintly striate, about 3-4-noded, the nodes glabrous, the internodes usually much exceeding the sheaths. Sheaths striate, more or less glabrous or with scattered tubercle-based hairs, with a few scattered cilia at the collar. Ligule reduced to very short (about 0.25 mm.) cilia. Blades fine, narrow, usually closely inrolled but not setaceous, 5-15 cm. long, shallowly grooved, almost glabrous to more or less loosely pilose (rarely densely pilose) with tubercle-based hairs on the outer surface, very finely and obscurely scabrous on the inner surface. Panicles much exserted, 5-15 cm. long, few to many-flowered, linear, racemose or slightly branched in the lower part with the spikelets 2-5 together on the branches, the branches erect when dry, laxly spreading at anthesis when fresh, the rhachis and pedicels finely scabrous. Spikelets pale greenish to straw-coloured, 6-10- (usually 7-8-) flowered, the group of florets usually exceeding the glumes, cohering in a semi-cylindrical mass. Glumes subequal or irregularly unequal, 7-16 mm. long, rather narrowly divergent, 5-7-nerved, with membranous margins, acute or narrowly erosely truncate, lanceolate, scaberulous on the nerves, very rarely pilose with a few hairs. Callus prominent, stipe-like, usually about 1.5-2 mm. long, hairy on the sides at the base, glabrous above, the hairs usually not obscuring the callus, the callus of the lowest floret shorter. Lemma linear to oblanceolate when folded, pilose with hairs, about 1-2 mm. long at the base and in marginal tufts placed well below the level of the sinus, and sometimes also with 2 dorsal tufts, grooved between the lower series of hairs and the callus, variable in dimensions but normally the body of the lowest floret about 4.5-5.5 mm. long including the callus (in small forms only 3.5 mm.), thinly indurated, veined, smooth, shining, pale; lateral lobes often rather broad with membranous margins often narrowing rather abruptly (either acutely, obtusely or truncately) into the fine setae which are about equal in length to the expanded part of the lobe in the lower florets of the typical form, either much shorter or much longer in other forms, variable in length but often about 7 mm. in all in the typical form; lateral lobes of the upper florets usually conspicuously diminishing in length towards the apex of the spikelet, the lobes of the uppermost florets sometimes even obtuse and awnless; central awn much exserted, often about 14 mm. long, brown and twisted in the lower part for about 4 mm., straight above, rather fine. Palea about 4-5 mm. long, typically much exceeding the sinus, elliptical, obtuse or minutely bifid, glabrous on the back, sometimes with a few long hairs between the keels and the margins in the lower part. Anthers 1.5-2 mm. long, yellow. Caryopsis obovate, 2.5 x 1.3 mm. Fig. 30.

LOCALITIES: *Queensland*: Mt. Gravatt, near Brisbane, L. S. Smith No. 293, 15.2.1938 (BRI.); Darling Downs, F. Mueller (MEL.; K.); Toowoomba, S. T. Blake No. 5136, 10.2.1934 (BRI.; K.; NSW. 3393; MEL.); Toowoomba, D. A. Goy, 12.3.1940 (BRI.); Lamington National Park, ca. 3,000 feet, S. T. Blake No. 13018, 24.5.1937 (BRI.; NSW. 3395); Wyerba, ca. 2,500 feet, S. T. Blake No. 4633, 23.1.1933 (BRI.; K.; NSW. 3394); about 4 miles from Spring Creek, Killarney Road, D. A. Goy and L. S. Smith No. 335, 1.5.1938 (BRI.); Wallangarra, ca. 3,000 feet, S. T. Blake No. 4428, 12.1.1933 (BRI.; K.; NSW. 3384), and No. 4429 (BRI.; K.).

New South Wales: Near Maryland on the border of N.S.W. and Q., E. Hickey, 1884 (MEL.); Glendon, Leichhardt (MEL.); Warialda, J. Vickery, 1.1932 (NSW. 3282); Warialda district, ca. 1,500 feet, G. B. Vickery, 8.11.1933 (NSW. 3277; K. 20); Glen Innes, J. L. Boorman, 3.1917 (NSW. 3313, 3314); Glen Innes, E. Cheel, 8.12.1934 (NSW. 3289); Inverell, E. O. Thomas, 11.1912 (NSW. 3274); Guyra, ca. 3-4,000 feet, J. Vickery, 30.12.1934 (NSW. 3271, 3279; SYD.; K. 22), a form with slightly pilose glumes and densely pilose leaves; Guyra, E. N. McKie No. 2451, 28.3.1946 (NSW. 3297); Guyra, E. N. McKie No. 362, 4.1930 (NSW. 3290); Guyra, H. A. Grantham Nos. 11, 15, 19.5.1941 (NSW. 3371, 3376); Stonehenge, H. A. Grantham No. 6a, 5.1940 (NSW. 3382); head of the Gwydir, F. Mueller (MEL.), Syntype of var. *biaristata* Benth.; Barraba, H. M. R. Rupp, 3.1914 (NSW. 3387); Armidale, ca. 3,000 feet, J. Vickery, 30.12.1934 (NSW. 3272; K. 21); Armidale district, C. K. Ingram, 12.1938 (NSW. 3276, 3312, 3317, 3327, 3380, 3381), and 12.1939 (NSW. 3318, 3438); Walcha Road, J. L. Boorman, 12.1912 (NSW. 3275, 3294); Walcha district, Yarrowitch to Tia, J. H. Maiden, 11.1897 (NSW. 3319); Barradine, W. Forsyth, 10.1899 (NSW. 3295); Plains near Barradine, W. Forsyth, 10.1899 (NSW. 3281); Moombi Range Stock Reserve, H. A. Grantham No. 10, 19.5.1941 (NSW. 3378); Tamworth district, J. Vickery, 1.1.1935 (NSW. 3284; K.); Kars Springs, Scone, T. G. B. Osborn, 23.1.1934 (SYD.); Moonan Brook near Scone, H. Carter, 1883 (MEL.); Mudgee, M. E. Scott, 26.2.1941 (NSW. 3372, 3385); Rylestone, E. Nock, 2.1937 (NSW. 3322); Hawkesbury River Station, J. B. Cleland, 3.4.1912 (NSW. 3292, 3293); Kurrajong Heights, R. A. Black, 13.11.1928 (RAB.); Katoomba, 3,000-3,400 feet, S. T. Blake No. 13934, 23.1.2939 (BRI.); Woodford, D. L. W. Henderson, 3.1945 (NSW. 3278); Pennant Hills, J. Vickery, 17.5.1947 (NSW. 3397); Wahroonga, E. Cheel, 30.9.1910 (NSW. 3288); Wahroonga, W. F. Blakely, 10.1913 (NSW. 3329, 3330); Killara, W. F. Blakely, 12.1912 (NSW. 3338); Waitara, W. F. Blakely, 4.1914 (NSW. 3335, 3336); Gladesville, H. Deane, 3.1887 (NSW. 3334); Normanhurst, C. T. White No. 10288, 23.12.1935 (MEL.); Epping, W. F. Blakely, 11.1913 (NSW. 3316); Homebush, J. Vickery, 7.2.1931 (NSW. 3349; K. 19), 4.1931 (BRI.), and 24.1.1941 (NSW. 3280); Homebush, J. H. Maiden, 3.1894 (NSW. 3351); Homebush, G. B. Vickery, 23.4.1929 (NSW. 3354); Rose Bay, W. F. Blakely, 12.1912 (NSW. 3326); Botany Swamp, W. F. Blakely, 12.1912 (NSW. 3331, 3333; MEL.; K.); Botanic Gardens, Sydney, W. F. Blakely, 5.1914 (NSW. 3356); Hurstville, J. H. Camfield, 4.1901 (NSW. 3358); Guildford, W. F. Blakely, 25.10.1913 (NSW. 1803); Peakhurst, E. Cheel, 25.11.1899 (NSW. 3285, 3321) and 25.11.1909 (N.S.W. 3325); Telopea, D. O. Cross, 1931 (NSW. 3355); Macquarie Fields, per Glenfield Veterinary Research Station, 6.3.1945 (NSW. 3437); Campbelltown, E. Cheel, 1.1914 (NSW. 3286); Campbelltown, E. Betche, 5.1885 (NSW. 3353); Swashfield via Oberon, F. Johnson, 31.1.1941 (NSW. 3371); Dapto, E. Breakwell, 12.1913 (NSW. 3324); Bargo, R. H. Cambage No. 4426 (NSW. 3332); Bulli, S. Johnson, 1875 (MEL.), Syntype of var. *biaristata* Benth.; Wombeyan Caves, E. Cheel and J. B. Cleland, 12.1919 (NSW. 3287); Tilba, E. Breakwell, 12.1913 (NSW. 3296); Hill Top, E. Cheel, 4.1910 (NSW. 3323) and 8.12.1912 (NSW. 3340); Canberra, 24.12.1929 (CAN.); Holbrook Park, E. J. McBarron No. 830, 2.4.1947 (NSW. 3370); Bodalla (NSW. 3350); Bega, E. Breakwell, 12.1913 (NSW. 3339, 3352); Albury, R. A. Black, 15.1.1936 (RAB.).

Victoria: Hannaford (NSW. 3391); Wodonga, Murray River, C. French, 1886 (MEL.); Barnawartha, R. A. Black, 13.11.1939 (RAB.); Mitta Mitta, R. A. Black, 8.3.1936 (RAB.; K.); Bobinawarrah, R. A. Black, 18.12.1934 (RAB.; K.); Baddaginnie, R. A. Black, 6.11.1935 (RAB); Strathbogie, R. A. Black, 16.11.1933 (RAB); Waranga Basin, Tatura, R. A. Black, 26.11.1934 (RAB.; K.); Swift's Creek, Gippsland, R. A. Black, 9.11.1939 (RAB.); Cathkin, R. A. Black, 14.11.1933 (RAB.; MEL.); Wallan, R. A. Black, 19.6.1939 (RAB.); Clarendon, Tepper Nos. 1129, 1131 (MEL.); between Melbourne and Tooradin, S. T. Blake, No. 7272, 20.1.1935 (BRI.; NSW. 3392); Geelong, H. B. Williamson, 7.1905 (NSW. 3390).

Tasmania: Clarke Is., E. Maclaine, 1894 (MEL.); Cataract Gorge, S. Esk River, Launceston, W. M. Curtis No. 53, 27.10.1943 (K.); foot of Mt. Nelson, E. Cheel, 3.1910 (NSW. 3383); Blackman's Bay, W. M. Curtis, 31.11.1947 (HO.; NSW. 9713); Southport, C. Stuart (K., in part).

South Australia: Interior of South Australia, F. Mueller (MEL.), Syntype of var. *multiflora* Benth.; Flinder's Ranges, F. Mueller (MEL.); Flinder's Ranges, Melrose, on foothills of Mt. Remarkable, S. T. Blake No. 16932 in part, 2.9.1946 (BRI.); National Park, J. B. Cleland, 15.12.1939 (JBC.; NSW. 4036); Glen Osmond, C. M. Eardley, 7.12.1934 (ADW. 391); Mt. Barker, J. B. Cleland, 4.12.1943 (JBC.; NSW. 4037); Mt. Barker, F. Liebelt, 6.1936 (ADW. 391).

Western Australia: Bridgetown, F. Stoward No. 524 (K.) appears to be a form of this species.

Also in New Zealand; see note under *D. pilosa*.

30a. Var. **obtusata** F. Muell. ex Benth., Fl. Austral., VII (1878), 594.

Holotype: *New South Wales*: New England, C. Stuart (K.; duplicates at MEL.).

Synonym: *D. racemosa* var. *multiflora* Benth., Fl. Austral., VII (1878), 594.

Differs from the Type in the lateral lobes of the lemma very obtuse or obtusely truncate, without points, or narrowed abruptly and excentrically into short points.

Localities: *Queensland*: Toowoomba, 2,000 feet, S. T. Blake No. 5153, 12.2.1934 (BRI.; NSW. 3368; MEL.; K.); Darling Downs, F. M. Bailey (AD.); Warwick, Beckler (MEL.; K., Syntype of var. *multiflora* Benth.); Stanthorpe, B. Scortechini, 12.1883 (NSW. 3365, 3366); near Stanthorpe, M. S. Clemens, 11.11.1943 and 18.11.1943 (K. ex U.S. Nat. Herb.).

New South Wales: New England, C. Stuart (K., Syntype of var. *multiflora* Benth.); Warialda, G. B. Vickery (NSW. 3362); Warialda, J. Vickery, 19.12.1934 (NSW. 3363); Guyra, 4,330 feet, E. N. McKie No. 2006, 24.12.1931 (NSW. 9373; MEL.); Armidale, J. B. Cleland, 2.1913 (NSW. 3369); Walcha, H. A. Grantham No. 13, 19.5.1941 (NSW. 3364); Barradine Plains, W. Forsyth, 31.10.1899 (NSW. 3360, 3367); Coonabarabran, F. S. Failes, 11.1901 (NSW. 3359, 3361; MEL.).

In the Holotype specimen of *D. racemosa* the lower lemmas are very oblique at the apex and bear moderately short setae, and the upper lemmas have progressively shorter setae but are still obliquely acuminate.

The species displays a bewildering variety of forms, varying chiefly in the degree of branching of and number and density of the spikelets in the inflorescence, the size of the spikelet, and in the structure of the florets, specially of the lateral lobes of the lemmas. This variation led Bentham, as the result of his examination of the limited number of specimens at his disposal, to recognise four varieties under *D. racemosa* in addition to the typical form. Examination of a long series of specimens shows, however, that in several cases the distinguishing characters by which he delimits the varieties are of little or no taxonomic value in the group.

Var. *obtusata* Benth. is typically a distinctive form, with short, obtuse lateral lobes with only very short or no points, and at first sight appears very distinct from normal *D. racemosa* and worthy of specific rank. It is connected with *D. racemosa* by so many intermediate forms, however, that such treatment would appear to be unwise. A large proportion of specimens from the New England Tableland and southern

Queensland, as well as many others, have the lower lemmas with long points on the lateral lobes as in the southern forms of *D. racemosa,* but the lateral lobes of the upper florets obtuse and with very short points approaching the condition found in var. *obtusata.* It is retained here for reasons of practical convenience, but it seems that it has not yet evolved sufficiently to be well fixed. Doubtless some degree of interbreeding with the parent species still occurs and accounts for the many intermediate conditions found. Bentham's characterization as "a smaller plant. Leaves more hairy", does not appear to have any significance; these features are a result of conditions of the habitat.

Var. *biaristata* Benth. seems insufficiently distinct to be worthy of recognition, and very similar indeed to the Type of *D. racemosa.* The width of the lateral lobes varies by infinite gradations, and no discontinuity can be found between forms in which the membranous margins grade acuminately into the awns and those in which they grade more acutely or even somewhat obtusely into the awns. In some forms the outer edges of the margins narrow abruptly leaving a notched edge.

Var. *penicillata* Benth. is based on *D. penicillata* (Labill.) Beauv., which with some hesitation has been retained as a distinct species in the present paper. It is closely related to some forms of *D. racemosa.*

Var. *multiflora* Benth. seems insufficiently distinct from var. *obtusata.* The spikelet structures are identical, and the characters given, viz. "Spikelets often two together and all approximate" are applicable to all the forms of *D. racemosa.* Examination of populations in the field shows that the degree of branching of the inflorescence and the number of spikelets borne is a result of habitat conditions. Plants growing on poor soil or during dry conditions may have the inflorescence reduced to a simple raceme, in extreme cases bearing only two or three spikelets. On richer soil or in moister conditions the inflorescences are branched in the lower part and bear one to five spikelets from each joint. Of the specimens cited by Bentham, those from "Warwick, Beckler," and "New England, C. Stuart" agree with var. *obtusata*; that from "Interior of South Australia, F. Mueller" is normal *D. racemosa.* Var. *obtusata* and var. *multiflora* were published simultaneously, but the former epithet is here adopted as it is the more appropriate, it appears first on the page, and because var. *multiflora* was published with some doubt expressed as to its being a definite variety.

In the Flora Australiensis Bentham included a specimen of *D. nudiflora,* viz. "Cobberas Mountains, F. Mueller" under *D. racemosa* var. *biaristata.*

D. racemosa is closely related to *D. pilosa* and *D. penicillata,* and their affinities are discussed under the former species.

Both the species and variety are slender but useful grasses in the pastures in which they occur. The variety is found chiefly on the northern tablelands and north-western slopes of New South Wales and in southern Queensland.

31. D. nudiflora P. F. Morris in Vict. Nat., LII (1935), 111 (figured).

HOLOTYPE: *Victoria*: Cobberas Mountains, 5-6,000 feet, F. Mueller (MEL.; duplicate at K.).

Short, erect, sub-alpine perennial, 10-30 cm. high, often growing up through peaty turf and then with a short, crowded, erect or ascending rhizome, or sometimes the plant simply caespitose. Culms about 2-noded, densely covered with old sheaths at the base, smooth, rigid, glabrous except for a slight, minute pubescence just below the inflorescence, often only slightly exceeding the leaves. Sheaths glabrous, smooth, lightly striate with few, distinct nerves, sometimes shining, the lower sheaths often exceeding the internodes. Ligule reduced to a row of very short cilia. Blades rigid, inrolled, more or less subulate, smooth, somewhat shining, sub-pungent, glabrous, 2-10 cm. long. Panicle 3-7 cm. long, sometimes only slightly exserted, few-flowered (with about 5-10 spikelets), compact, linear or narrow-lanceolate, the rhachis and branches pubescent, erect, the pedicels often very short. Spikelets often purplish, 5-6-flowered, the group of florets about two-thirds to three-quarters as long as the glumes, closely packed. Glumes only narrowly divergent, 8-13 mm. long, subequal, or sometimes the lower glume slightly exceeding the upper, acute, firm, 5-nerved, with firmly membranous margins. Lemma pale-coloured, fusiform, the body about 3 mm. long including the pilose callus, glabrous on the back or very rarely with 2 slender dorsal tufts of hairs, smooth, shining, 9-nerved, with two, more or less distinct tufts of hairs on each margin; lateral lobes about 5 mm. altogether, the lower flat portions with more or less purplish membranous margins tapering for about 2.5 mm. into the short, delicate, fine setae; central awn about 8 mm. long, much exceeding the lateral lobes, more or less erect or at length somewhat reflexed, light brown and loosely once or twice twisted at the base. Palea much exceeding the sinus, about 4 mm. x 1.5 mm. when flattened, oblong-lanceolate, erosely truncate or minutely bifid at the apex, very minutely ciliolate on the keels and at the apex, sometimes with a few hairs between the keels and the margins, glabrous on the back but minutely pubescent on the inner surface in the upper part. Anthers pale-yellow, 1-1.25 mm. long. Fruit oblanceolate, 2 x 0.8 mm., convex on one side, flat to slightly concave on the other. Fig. 31.

Localities: *New South Wales*: Thredbo River, Mt. Kosciusko, J. H. Maiden and W. Forsyth, 1.1889 and 2.1899 (NSW. 1115, 1118, 1121); Mt. Kosciusko, 5,500 feet to summit, J. H. Maiden, 1.1898 (NSW. 1113, 1116); Mt. Kosciusko, J. Vickery, 4.2.1930 (NSW. 1120; SYD.); Mt. Kosciusko, 6,500 feet, J. Vickery, 14.1.1940 (NSW. 1119); Bett's Camp, Mt. Kosciusko, J. McLuckie and A. Petrie, 1924 (SYD.); summit of Mt. Kosciusko, 7,305 feet, N. T. Burbidge, 23.2.1952 (CAN. 3722); above Charlotte Pass, Mt. Kosciusko, 6,300 feet, N. T. Burbidge, 23.2.1952 (CAN. 3724); between Seaman's Memorial Hut and Snowy River Crossing, Mt. Kosciusko, ca. 6,500 feet, N. T. Burbidge, 24.11.1952 (CAN. 3753A).

Victoria: Stony summit of Cobberas Mountains, F. Mueller, 2.1854 (Paratype, MEL.); Cobberas, N. A. Wakefield No. 2935, 27.1.1949 (NSW. 7327); Bogong High Plains, A. J. Tadgell, 1935 (MEL.; NSW. 1122); High Plains, flat under Mt. Fainter, A. J. Tadgell, 1.1928 (MEL.); Feathertop High Plains, flat under Mt. Fainter (MEL.); Mt. Bogong, A. J. Tadgell, 2.1923 (MEL.); Bogong High Plains, towards Mt. Nelson, 5-6,000 feet, A. J. Tadgell, 2.1930 (MEL.); Mt. Federation, Cerberean Ranges, 4,700 feet, J. H. Willis, 6.2.1943 (MEL.); Bright, J. B. Cleland (NSW. 1117); Buffalo Mt., J. B. Cleland (AD.); Mt. Buffalo, 4,500 feet, S. T. Blake No. 7329, 25.1.1935 (BRI.; MEL.); Nunniong Plateau, 4,000 feet, N. A. Wakefield No. 2641, 5.1.1949 (NSW. 7334).

Tasmania: Ben Lomond, summit, L. Rodway, 4.1896 (HO.); On tundra at foot of Cradle Mountain, ca. 2,000 feet, R. A. Black, 3.2.1946 (RAB); between Cradle Mt. and Moina, N. T. Burbidge, 1.2.1949 (CAN. 3535); Miena, Great Lake, R. A. Black, 27.1.1948 (RAB.).

The duplicate of the Type collection of *D. nudiflora* was referred by Bentham in the Flora Australiensis to *D. racemosa* var. *biaristata*.

D. nudiflora is abundant in grasslands at high altitudes in the Australian Alps, where it is commonly associated with *D. nivicola*. It is most closely related to *D. pilosa* and *D. penicillata* which it replaces at high elevations. Ecological studies would be desirable to determine whether in fact it does intergrade with them, as some specimens from intermediate altitudes have been difficult to refer to the one or the other. Some collectors have expressed the opinion that such intergradations does occur.

32. **D. nivicola** J. Vickery in Contrib. N.S.W. Nat. Herb., I, No. 5 (1950), 300. Figured in Agric. Gaz. N.S.W., XII (1901), 477, erroneously under the name of *D. pauciflora*.

Holotype: *New South Wales*: Mt. Kosciusko, 6,000 feet, J. Vickery, 14.1.1940 (NSW. 1110; duplicates at K.; CAN.).

SYNONYM: *D. pauciflora* var. ?*alpina* F. Muell. ex. Benth., Fl. Austral., VII (1878), 596, is conspecific with *D. nivicola,* though based on a different Type.

Small, erect, caespitose perennial about 20 cm. high, with a short, sub-erect rhizome. Culms smooth, very slender, about 2-3-noded, the nodes glabrous. Sheaths smooth, glabrous or the lower, scale-like sheaths sometimes pubescent on the nerves. Ligule inconspicuous, minutely ciliate. Laminae fine, setaceous, tightly inrolled, up to 10 cm. long, smooth, glabrous or sometimes with a few hairs on the inner surface. Panicle much exserted, small, about 2-3 cm. long, few-flowered, sub-racemose. Spikelets often purplish, about 8 mm. long, usually 4-flowered, pedicellate. Glumes usually purplish, slightly exceeding the florets, lanceolate, acute but not acuminate, the lower glume slightly exceeding the upper, both slightly keeled in the upper part, more or less smooth, or minutely ciliolate on the margins and minutely and sparsely scabrid on the keels towards the summit, the nerves inconspicuous. Lemma pale-coloured or slightly purplish, 2-lobed above the middle, with a central awn arising from between the lobes and shortly exceeding them, the lobes acute or shortly acuminate, not or scarcely awned, ciliolate on the margins, the lemma 3-4 mm. long, obscurely 3-nerved, smooth on the back except for a few scattered hairs towards the base and two tiny tufts at the level of the sinus, with a tuft of hairs on the callus and two tufts near each margin. Palea almost equalling the lateral lobes, ciliolate on the margins, truncate-obtuse or minutely bifid at the apex. Anthers 3, about 1 mm. long, deeply divided between the cells. Fig. 32.

LOCALITIES: *New South Wales*: Bett's Camp, Mt. Kosciusko, J. H. Maiden, 16.2.1914 (NSW. 1105, 1108); Mt. Kosciusko, R. Helms (NSW. 1104, 1109); Mt. Kosciusko, in alpine grassland, J. Vickery, 4.2.1930 (NSW. 1111, 1112; SYD.); head of Spencer's Creek, Kosciusko, 5,900 feet, L. A. S. Johnson and E. F. Constable, locally frequent amongst snow-grass, 19.1.1951 (NSW. 15972); below Seaman Memorial Hut near Snowy River Crossing on road to Kosciusko summit, 6,500 feet, N. T. Burbidge, 24.2.1952 (CAN. 3753); Mt. Kosciusko, just below summit, 7,100 feet, N. T. Burbidge, 24.2.1952 (CAN. 3740).

Victoria: Summits of the Australian Alps, F. Mueller (MEL.; K., Type of *D. pauciflora* var. *alpina* F. Muell ex. Benth.); Victorian Alps, A. J. Tadgell (MEL.); Bogong High Plains near Mt. Cope, R. T. Patton, 20.1.1940 (MEL.); Mt. Buffalo, in morasses, 4,500 feet, S. T. Blake No. 7358, 25.1.1934 (BRI.; MEL.; NSW. 1107); Mt. Feathertop High Plains, A. J. Tadgell, 1.1928 (MEL.).

Tasmania: Mt. Rufus, N. T. Burbidge, 25.1.1949 (CAN. 3356); The Steppes, R. A. Black, 28.3.1948 (RAB.; NSW. 10783); Franklin River, on Lyell Highway, J. Vickery, 23.1.1949 (NSW. 19753).

The Tasmanian specimens differ slightly from those of the mainland in that the awn is rather longer and often reflexed (but not twisted) at the base, and the leaves a little softer, but the differences are too slight to regard them as other than conspecific.

This species is abundant in grasslands at high altitudes in the Australian Alps, where it is often found associated with *D. nudiflora*. It resembles the latter in general aspect, but is easily distinguished by the much smaller, 4-flowered spikelets, the shorter, unawned lateral lobes of the lemma, the shorter awns and rather finer leaves.

D. nivicola was erroneously referred to *D. pauciflora* in Moore and Betche, Handb. Fl. N.S.W. (1893), 489; Maiden and Betche, Census of Pl. N.S.W., (1916), 22; Agric. Gaz. N.S.W., XII (1901), 477.

D. nivicola appears to occupy the same ecological habitat in Australia as do *D. nuda* Hook. f. (Fl. N. Zel., II (1855), 337) and *D. thomsonii* Buchanan (Indig. Grasses N.Z. (1880), Pl. XXXVI, 2) in New Zealand, and superficially to resemble them very closely. I have examined the Type specimen of *D. nuda* at Kew and find that it differs in the lemma bearing hairs in tufts across the back. *D. thomsonii* is difficult to typify from Buchanan's description, but some Otago sheets at Kew may have formed part of his material. Judging from these, the species differs in the very narrow spikelets, with the lemmas in rather a linear group and scarcely awned.

33. D. dimidiata n. sp.

Gramen gracile vel adscendens, caespitosum, perenne, 15-40 cm. altum. Culmi laeves, plerumque folia valde excedentes, 2-4-nodes, nodis glabris; vaginae subglabrae vel sparse pilosae praesertim ad bases, leviter striatae; ligula ciliis brevibus densis, utrimque ciliis longis; laminae plerumque tenues involutaeque vel interdum planae et circa 1-1.5 mm. latae, 2-12 cm. longae, laxe pilosae vel subglabrae. Panicula 2-6 cm. longa, linearis vel lanceolata vel ovato-lanceolata, breviter vel longe exserta, raro racemosa, circa 4-20 spiculas ferens; rhachides ramique interdum paullo patentes vel laxe contracti, pubescentes; spiculae pallido-viridescente-stramineae vel purpurascentes, plerumque 4-6-flores, quam glumas praeter aristis exsertis breviores. Glumae tandem modeste divergentes, angustiusculae, acutae vel acuminatae, 5-11 mm. longae, subaequales, 7-nervatae. Lemma pallidum oblongo-lanceolatum; corpus circa 2.5-3 mm. longum callum brevem pilosum includens, laeve et aliquantum nitidum, glabrum inter pilorum series duo sparsas, serie inferiore paulo supra callum disposita et vix superiorem attingente, superiore circa 1 mm. infra sinum disposita pilis vix sinum attingentibus, vel interdum pilorum fasciculis varie reductis vel absentis; lobi laterales breves, 2-4 mm. longi (raro usque ad 5.5 mm.), quam lemmatis corpus breviores vel aequantes, partibus inferioribus planis, plus minus abrupte et oblique angustatis ad setas breves vel solum acutis; setae quam aristae partem inferiorem contortam breviores vel absentes; arista circa 9-10 mm. longa, valde setas excedens, fusca et contorta usque ad 4-5 mm., geniculata. Palea sinum haud vel vix excedens, late oblonga vel oblanceolata, circa 2.5 x 0.8 mm., obtusa vel obtuse bifida, carinis apiceque minute ciliolata, altera plus minus glabra, nitida, firma. Antherae pallide flavescentes, circa 1 mm. longae. Caryopsis obovato-oblongum, circa 1.5 mm. x 0.75 mm.

HOLOTYPE: *Tasmania*: Huonville, L. Rodway, 12.1901 (HO.).

Slender, erect or ascending caespitose perennial, 15-40 cm. high. Culms very fine, smooth, usually much exceeding the leaves, 2-4-noded; nodes glabrous; sheaths sparsely pilose or subglabrous, often more pilose near the base, the lower sometimes more or less loose, lightly striate; ligule of short dense cilia, pilose with long cilia at the sides; blades mostly fine and inrolled, or sometimes flat and about 1-1.5 mm. wide, 2-12 cm. long, loosely pilose or subglabrous. Panicle 2-6 cm. long, linear, lanceolate or ovate-lanceolate in outline, shortly or much exserted, usually loosely contracted or sometimes almost racemose if small, usually the lower branches divided and slightly spreading, bearing about 4-20 spikelets, the rhachis and branches slender, pubescent. Spikelets pale greenish-straw-coloured or purplish, usually about 4-6-flowered, the group of florets about two-thirds as long as the glumes except for the exserted awns. Glumes becoming moderately divergent, rather narrow, acute or acuminate, 5-11 mm. long, subequal, 7-nerved. Lemma pale, oblong-lanceolate, the body about 2.5-3 mm. long including the short hairy callus, smooth and somewhat shining, glabrous on the back except for two rather sparse rows of tufts of hairs, the lower row placed a little above the callus and scarcely reaching to the upper, the upper row placed about the middle of the body and well below the sinus with hairs scarcely attaining or very shortly exceeding the sinus, sometimes the tufts of hairs variously reduced to lateral only or dorsal and lateral tufts; lateral lobes short and broad, 2-4 mm. (rarely up to 5.5 mm.) long, the lower parts flat and narrowing rather quickly and obliquely into short points or setae or sometimes only acute, the setae when present not or very shortly exceeding the lower twisted portion of the central awn; central awn much exceeding the lateral lobes, about 9 mm. long, geniculate, the lower portion strong, dark brown and twisted for about 4 mm. Palea shorter than or very slightly exceeding the sinus, broadly oblong or oblanceolate, about 2.5 x 0.8 mm., very obtuse or obtusely bifid, minutely ciliolate on the apex and keels in the upper part, otherwise more or less glabrous and shining on the back, firm. Anthers pale yellow, about 1 mm. long. Caryopsis obovate-oblong, 1.5 x 0.75 mm.

LOCALITIES: *Tasmania*: Archer (NSW. 2517); Mt. Nelson, W. M. Curtis, 29.1.1947 (HO.; NSW. 9711); near Derwent Bridge, N. T. Burbidge, 27.1.1949 (CAN. 3389); Waterworks, Hobart, L. Rodway, 3.1907 (HO.); L. Rodway No. 1009b, 1009c and 1009 c and d in part, (HO.); Ridgeways, L. Rodway, 1.1908 (HO.); 10 miles W of Copping, J. Vickery, 15.1.1949 (NSW. 19458); Recherche, Gunn No. 1578 (MEL.); near Eaglehawk Neck, W. M. Curtis, 15.2.1947 (HO.); Cockle Creek, No. 1574 (MEL.); Huonville, D. Martin (CAN.); on dry cliff near Lighthouse, Sth. Bruny Is., R. A. Black, 11.2.1948 (RAB.; NSW. 10787); Southport, Stuart (in part) (MEL.); Southport, No. 1575 (MEL.).

The suite of specimens cited above appear obviously conspecific in spite of differences among them in hair arrangement on the lemma and presence or virtual absence of short setae on the lateral lobes. Their closest affinity seems to be with *D. pilosa* in spite of the more or less complete row of hair tufts in most specimens, and they differ from it also in the very short lateral lobes and setae, and small size of spikelets and florets. Those specimens with hair-tufts reduced to lateral and dorsal tufts suggest a further relationship with *D. nudiflora* and *D. nivicola*, but *D. dimidiata* differs from them in the much longer central awn and its strong twisting at the base, and in the foliage which more strongly resembles *D. pilosa*. The broad lemma and short lobes distinguish this species from *D. setacea* and its allies. The resemblance to small flowered specimens of *D. pilosa* led me at first to consider it as only a variety of that species, but as an increasing amount of material became available it seemed at least as worthy of specific rank as certain other groups of the genus.

SPECIES IGNOTAE.

Steudel, in Syn. Pl. Gram. (1854), 14, described the genus *Plinanthesis* with two species, viz. *P. urvillei* from Montes coerulei (i.e., Blue Mountains), and *P. tenuior* from Port Jackson, both from the herbarium of d'Urville. The generic and specific descriptions suggest *Danthonia* rather than any other genus of grasses known to me occurring in these districts, but I have not been able to establish their identity.

RELATIONSHIPS OF THE SPECIES.

In fig. 33 an attempt has been made to illustrate the affinities displayed by the species considered according to the writer's concept. Since variability is so evident in most species, I have chosen to represent each (with the exception of the unique *D. bipartita*) by a star-like outline instead of the conventional circle. The number of arms or their length must not be taken to indicate any qualitative or quantitative attribute. It has been adopted as an arbitrary symbol suggestive of a population with a degree of homogeneity but with tendencies for individuals to diverge in various respects. Its form, moreover, assists in indicating relationships.

Just as the characters of the lemma and the distribution of hairs upon it appear to provide the most satisfactory means of differentiating between the species of *Danthonia*, so they seem also to provide the best key to their natural relationships. On the basis of these characters the Australian species of *Danthonia* appear to fall roughly into four series, but demarcation of these is imperfect, and each series, with one exception, grades somewhat imperceptibly into the next.

The first consists of a single species, *D. bipartita,* which is relatively isolated both in habit and in floral characters. Some justification might be found for regarding it as constituting a distinct genus, but its relationship to *Danthonia* is strong, and the suggestion of a morphological connection with more typical species may be found through *D. geniculata.* Although considered first, it is not suggested that *D. bipartita* represents a primitive condition, but that it represents rather an isolated line of specialisation.

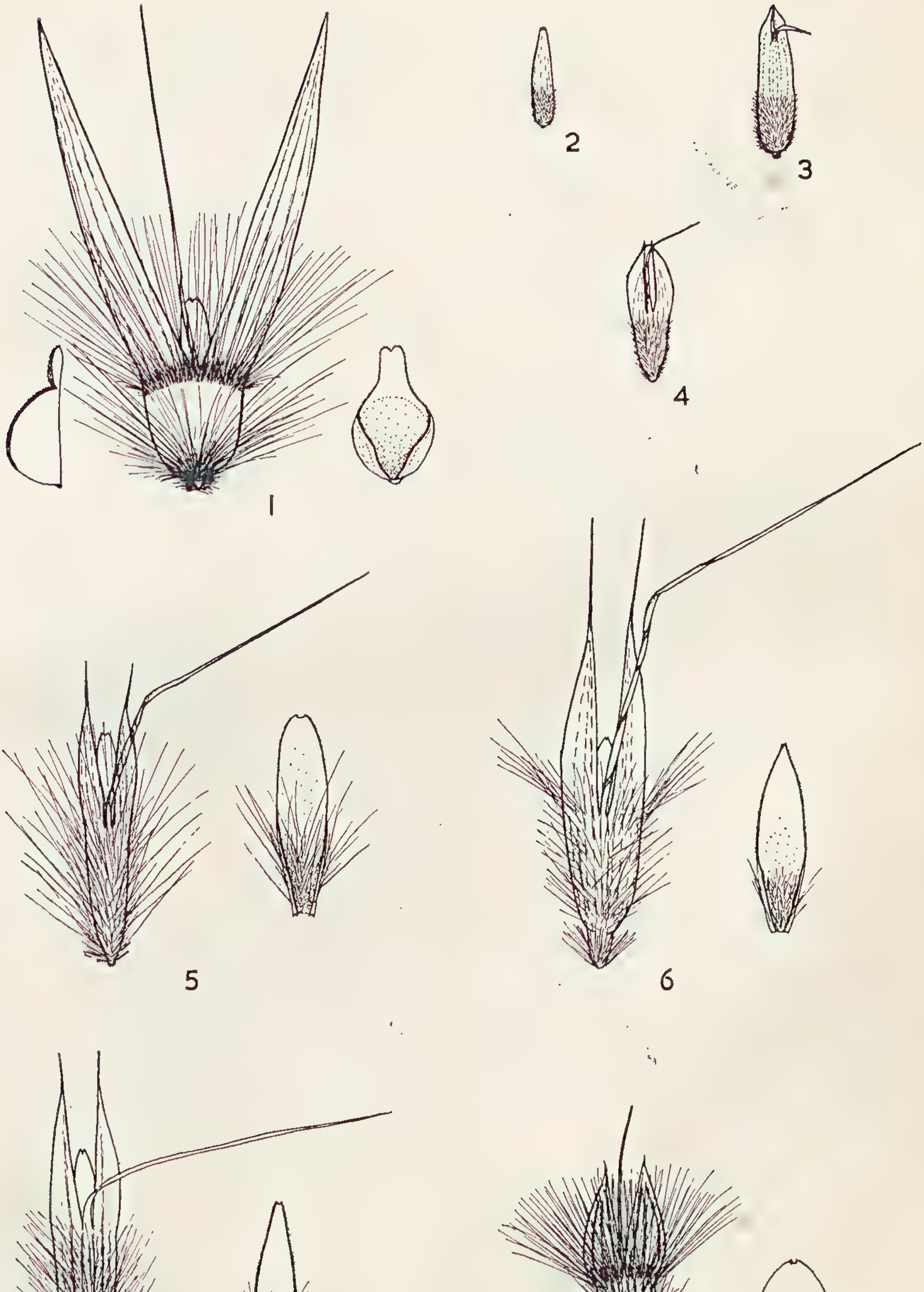
The second series is characterised by the scattered distribution of hairs on the body of the lemma. At the beginning of the series the hairs are uniform in length and all similarly scattered. At the end of the series there is organization of the hairs into a distinctly longer upper row or band while the lower hairs remain scattered.

D. rodwayi appears to be the least differentiated form found amongst the Australian species, and is considered to represent the most primitive condition. The minute bifurcation of the apex of the lemma with mere suggestion of the terminal awn could readily lead to confusion of this species with some species of *Poa* on casual examination. *D. paradoxa* is differentiated one stage further, with short though distinct awn and lobes, and connects *D. rodwayi* with the next species *D. vickeryi.* From the latter it is an easy transition to *D. pallida.* While markedly differing in habit, on floral characters *D. frigida* may be considered not far removed from *D. pallida.* Actually, however, its affinities appear to be with a group of New Zealand species represented by *D. cunninghamii* Hook. f., *D. raoullii* Steud. and *D. flavescens* Hook. f. rather than with any other Australian species. On the other hand *D. pallida* may be considered related to *D. clelandii, D. induta, D. linkii* and *D. richardsonii* in which the hairs on the lemma become gradually lengthened upwards into an upper transverse series of longer hairs not very sharply differentiated. In an allied sub-group containing *D. semiannularis, D. longifolia* and *D. occidentalis* the upper band of long hairs becomes sharply differentiated from the lower short scattered hairs. *D. carphoides,* although distinctive in individual character, is by no means remote in floral structure from *D. richardsonii* and clearly belongs to this series, as does *D. geniculata.* The latter, through *D. monticola* and *D. purpurascens,* would connect this series with the third series. Such species as *D. setacea,* though fitting naturally into the next series, often show imperfect suppression of the dorsal hairs.

In the third series the hairs of the lemma are more or less restricted to two transverse bands of tufts of hairs, but occasional species or occasional individuals may display transitional stages, and relationships to the state found in *D. richardsonii* and *D. linkii.* The series is dominated by the large and variable population referred in this paper to *D. caespitosa,* to which all the other species of the series appear to be more or less closely related. In figure 33 it is visualised as a large and radiating star from which the remainder are suggested as off-shoots or satellites, differing in one or more particulars. Of these, *D. duttoniana, D. procera, D. alpicola, D. setacea* and *D. acerosa* require no further comment here. *D. pauciflora* is a form of the group much modified by its alpine habitat. *D. purpurascens* seems to stand close to *D. monticola* on the one hand and to *D. eriantha* on the other, and the latter in turn seems closely related to *D. auriculata* which differs chiefly in the truncated membranous margins of the lateral lobes. *D. laevis,* which differs in the suppression of the lower transverse band of hairs, seems to take its place near one point of the radiating arms of *D. caespitosa,* and to stand equally close to *D. eriantha*; its affinities are with these rather than with the species of the fourth series in which the suppression of hairs has proceeded further. From still another point *D. caespitosa* appears to be related to the fourth series through *D. pilosa,* in which (as well as in *D. dimidiata*) suppression of the tufts of hairs appears to be imperfect in some transitional specimens. Other offshoots from *D. caespitosa* probably occur which are still imperfectly known to me, and which I have therefore included within the concept of this species.

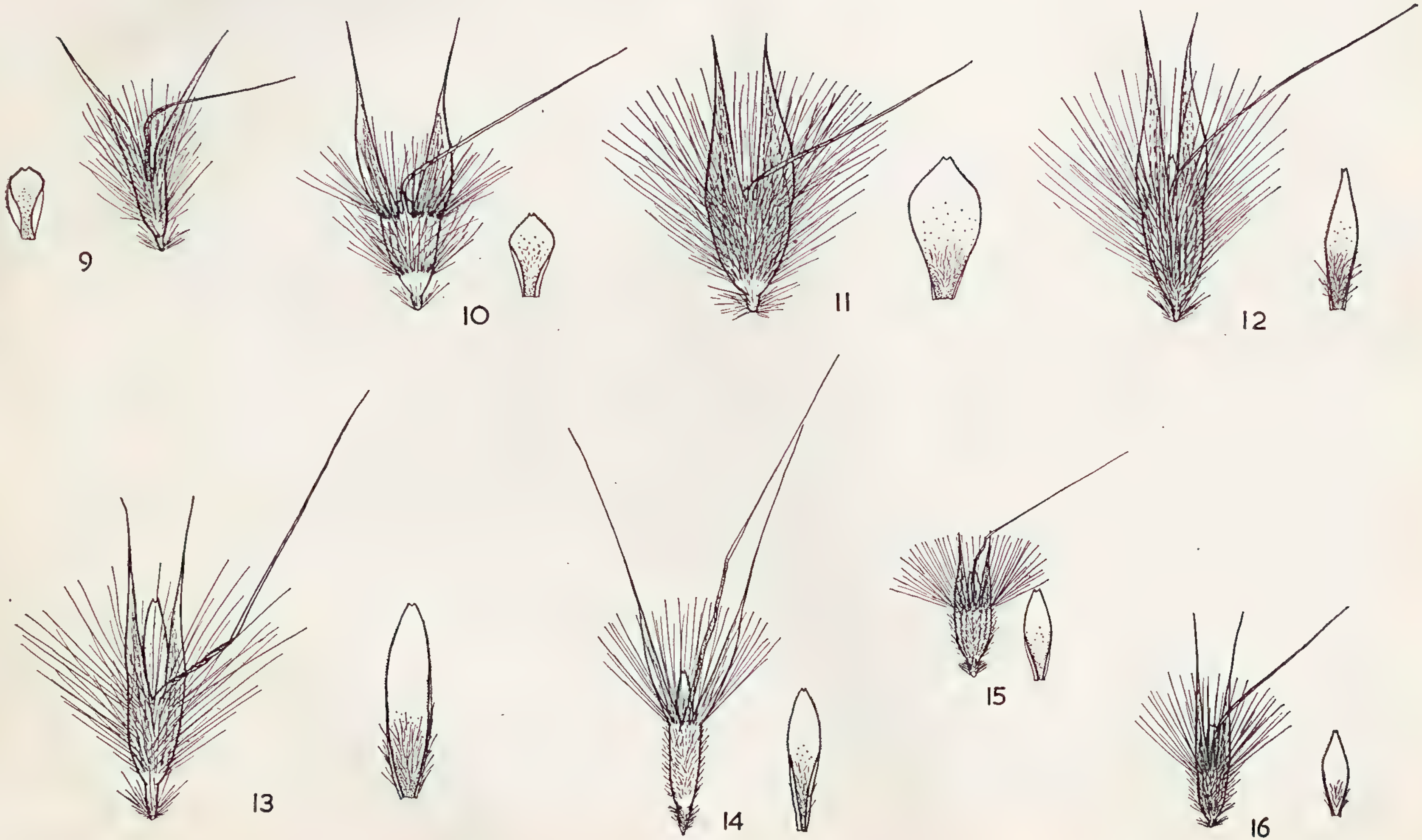
In the fourth series the hairs of the lemma are represented only by isolated marginal and dorsal tufts, the intermediate tufts having been suppressed. These dorsal and marginal tufts may also be suppressed, such suppression being partly of specific significance and partly an expression of intra-specific variability. Incomplete suppression may occasionally be seen in *D. pilosa* and more rarely in *D. racemosa*. *D. pilosa* may be visualised as standing in a central position with regard to this series, with *D. racemosa, D. penicillata* and *D. nudiflora* radiating from it, and *D. nivicola* at the end of the series linked through *D. nudiflora.*

Plate III.



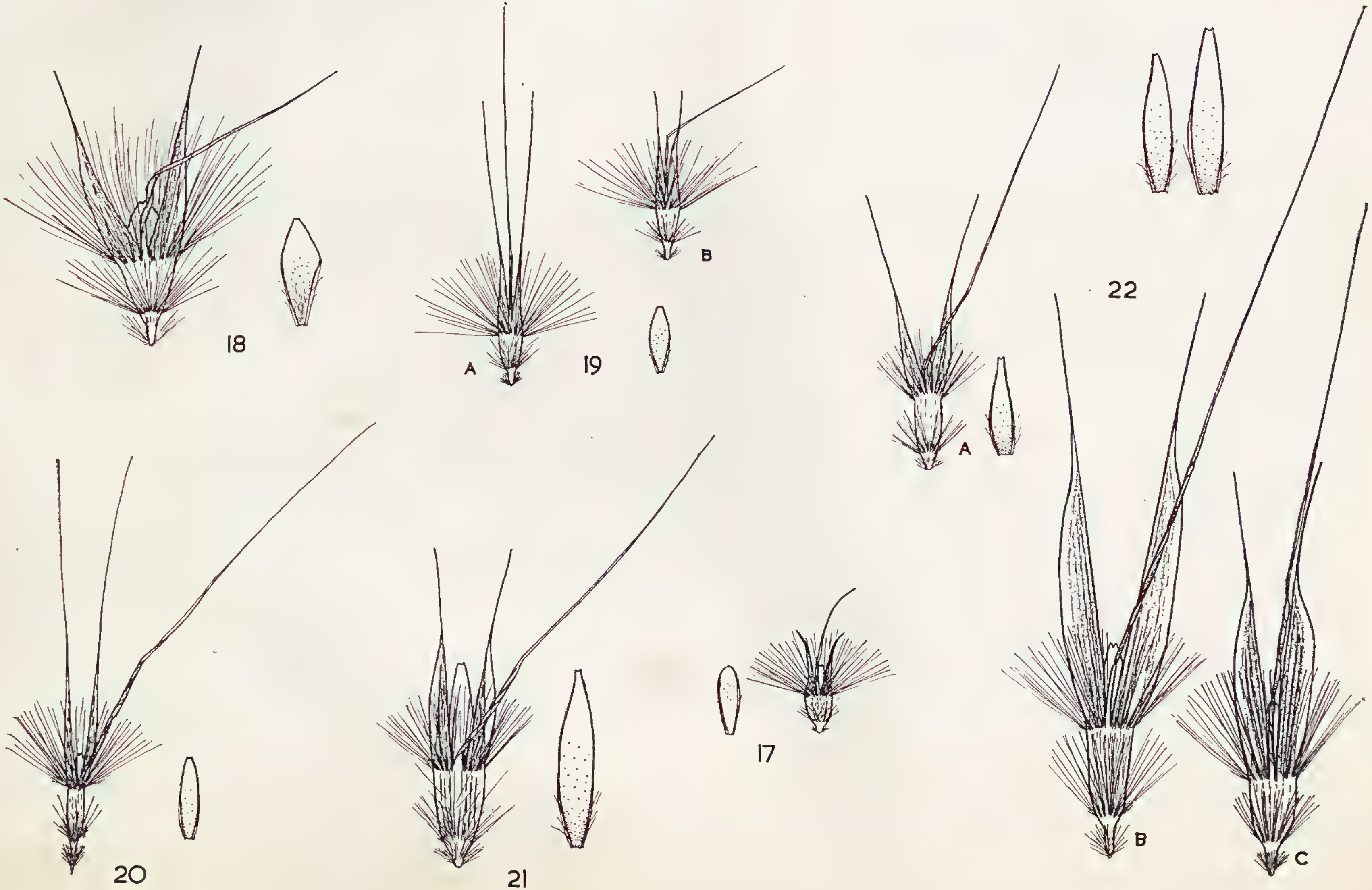
Figures 1-8, dorsal view of lemmas and (in figs. 1 and 5-8) paleas, X about 3.5. 1, *D. bipartita* (palea shown in both lateral and dorsal views). 2, *D. rodwayi.* 3, *D. paradoxa.* 4, *D. vickeryi.* 5, *D. pallida.* 6, *D. clelandii.* 7, *D. frigida.* 8, *D. carphoides.*

Plate IV.



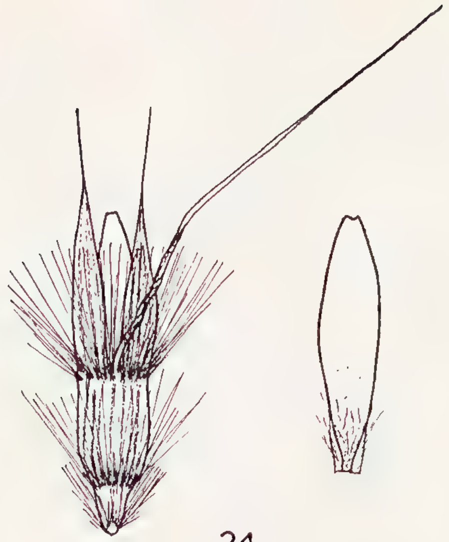
Figures 9-16, dorsal views of lemmas and paleas, X about 3.5. 9, *D. geniculata.* 10, *D. monticola.* 11, *D. richardsonii.* 12, *D. linkii.* 13, *D. induta.* 14, *D. occidentalis.* 15, *D. semiannularis.* 16, *D. longifolia.*

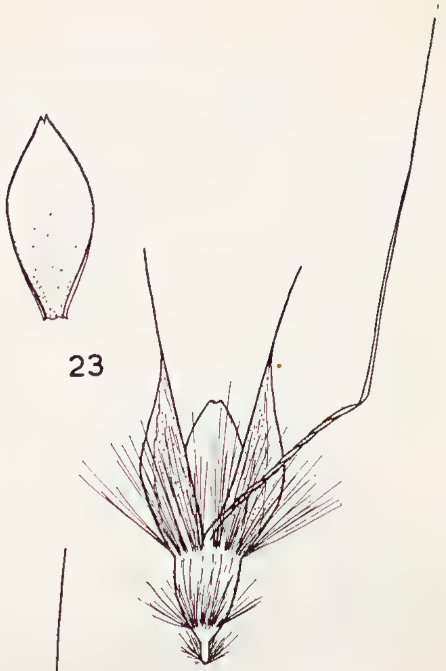
Plate V.

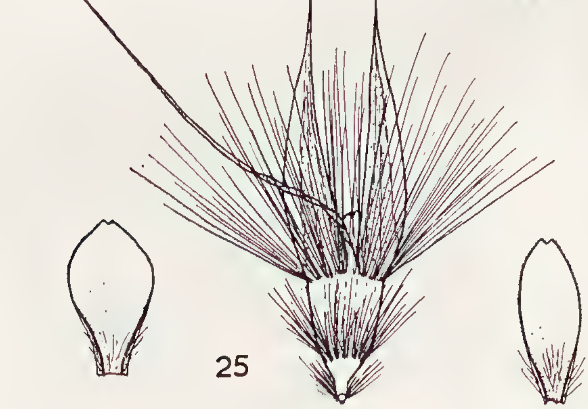


Figures 17-22, dorsal views of lemmas and paleas, X about 3.5. 17, *D. pauciflora.* 18, *D. purpurascens.* 19, A) *D. setacea,* normal form; B) var. *breviseta.* 20, *D. acerosa.* 21, *D. alpicola.* 22, A, B and C, forms of *D. caespitosa.*

Plate VI.


24


23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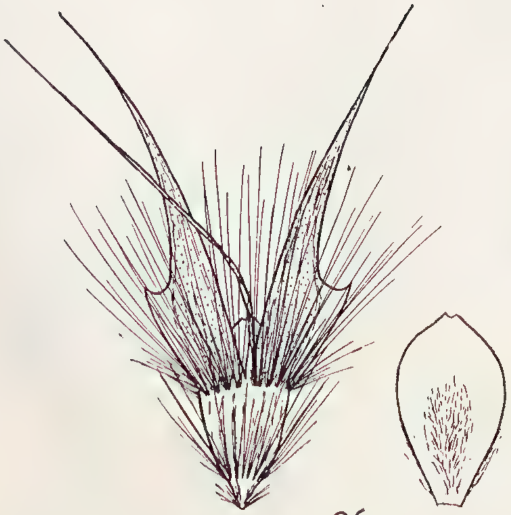
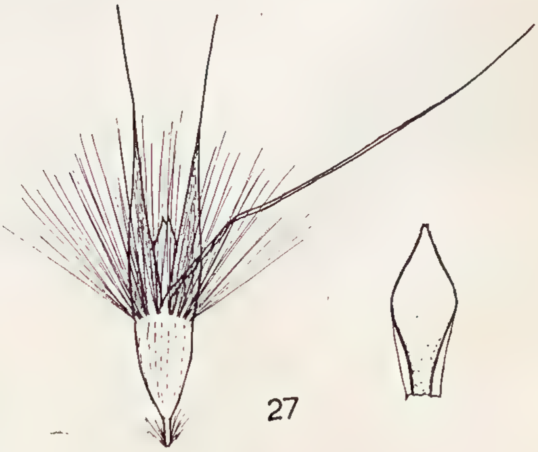
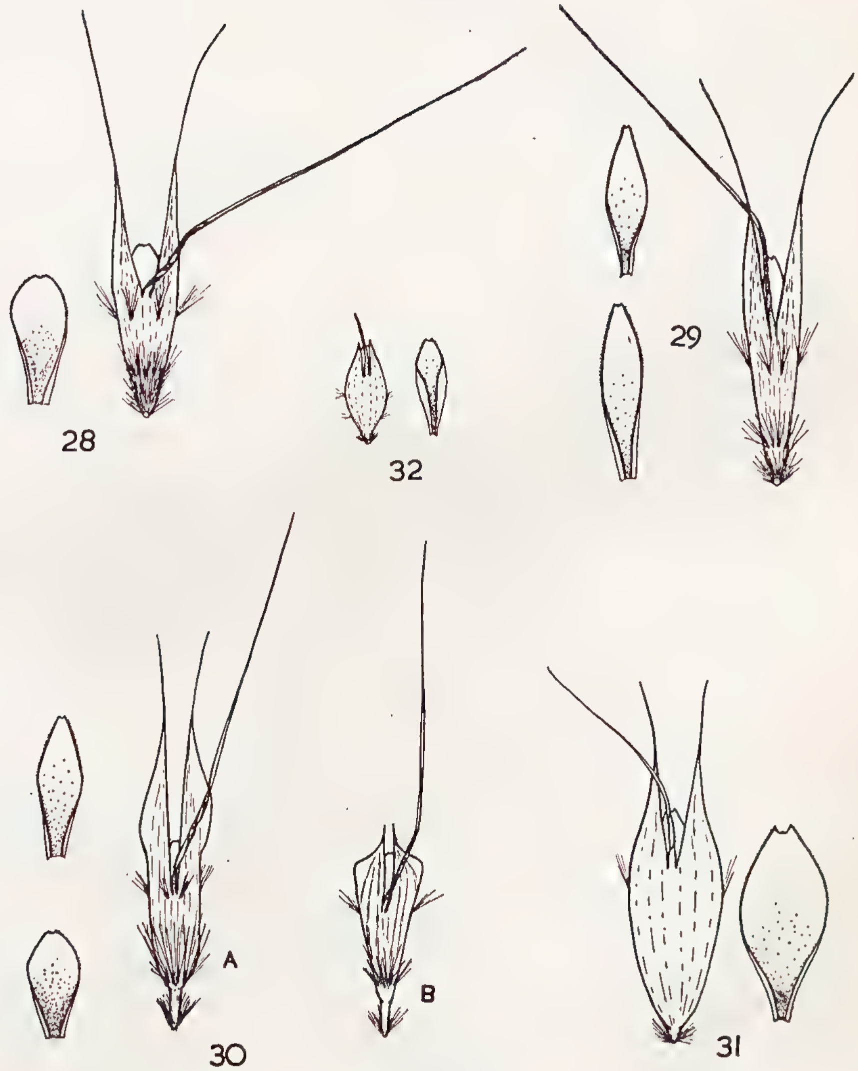

26


27

Figures 23-27, dorsal views of lemmas and paleas, X about 3.5. 23, *D. duttoniana.* 24, *D. procera.* 25, *D. eriantha.* 26, *D. auriculata,* with lateral lobes expanded to show auriculate margins. 27, *D. laevis.*

Plate VII.



Figures 28-32, dorsal views of lemmas and paleas, X about 3.5. 28, *D. pilosa.* 29, *D. penicillata.* 30, *D. racemosa,* (A) normal form; (B) var. *obtusta.* 31, *D. nudiflora.* 32, *D. nivicola.*

Plate VIII.

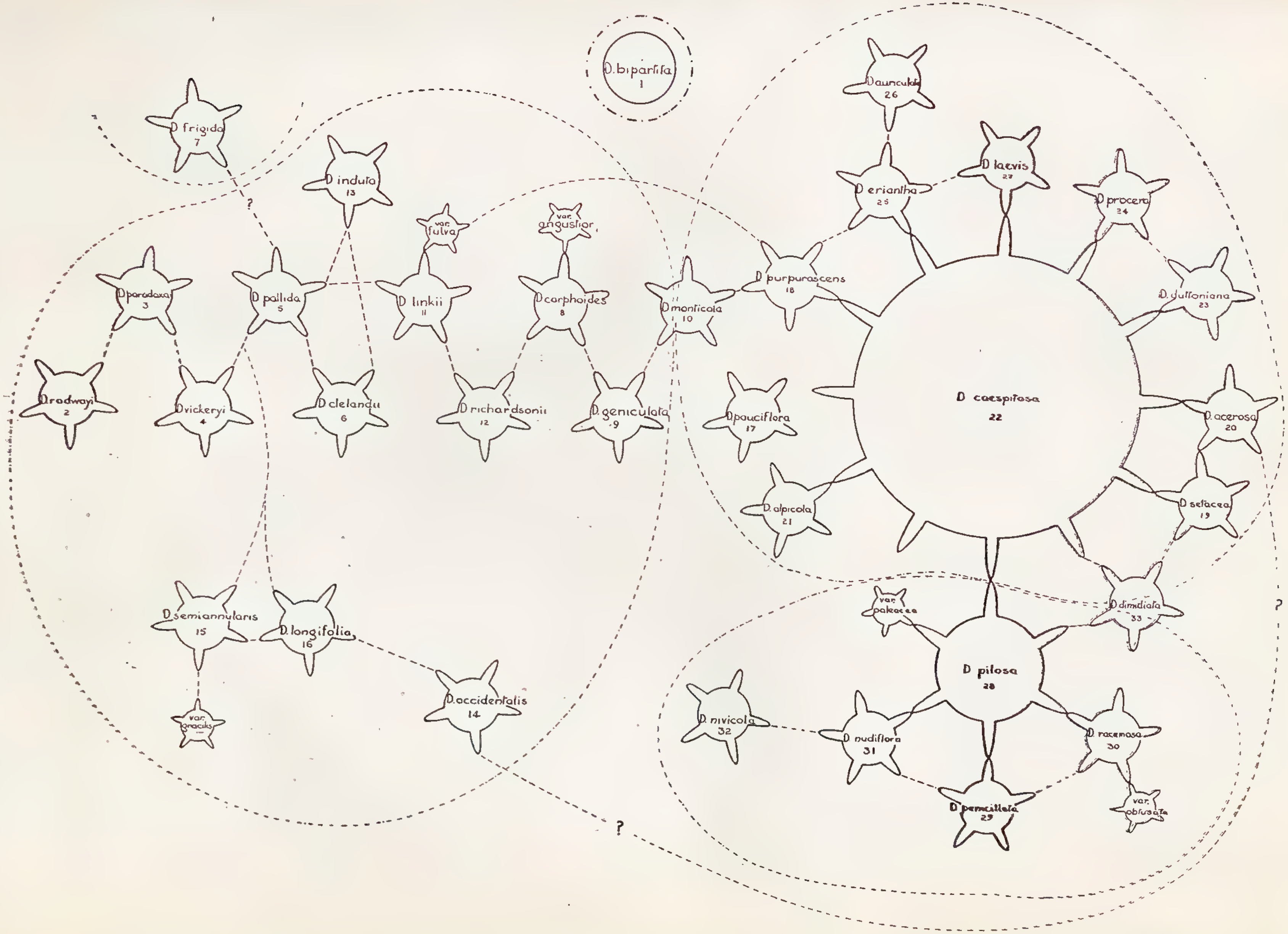


Figure 33, diagrammatic representation of the relationships considered to exist between the Australian species of *Danthonia*.

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The Cyatheaceae of Australia.

MARY D. TINDALE, M.Sc.

Cyathea is a large genus of about 830 species which are mainly distributed in the tropical regions of the world but some species extend southwards to Chile, Tasmania, New Zealand and South Africa. This genus is well-developed in Central and South America, the East Indies, Malaya, New Guinea and the Philippines. In some species the distribution is very localized, being confined to one mountain. There are 11 species in Australia (including the State of Tasmania) but to my knowledge only two of them occur outside this country, namely *C. cunninghamii* Hook. f. in Hook. which is also found in both New Zealand and the Chatham Islands, and *C. celebica* Bl. of Ternate, the Moluccas and Papua.

I have followed most modern authors by including the bulk of the species of *Alsophila* and *Hemitelia* with *Cyathea,* as it is generally recognized that the old classification based on indusial characters is not satisfactory. There is a good deal of variation in the indusia of the Australian species of *Cyathea.* They vary from a cupuliform indusium with a pore-like aperture in *C. grevilleana* Mart. to the hemitelioid (hemispherical) indusia of *C. marcescens* N. A. Wakefield, *C. robertsiana* (F. Muell.) Domin, *C. woollsiana* (F. Muell.) Domin and sometimes of *C. cunninghamii,* but in the bulk of the Australian species there is a ring of scales which surrounds the receptacle. The sori are exindusiate in both *C. rebeccae* (F. Muell.) Domin and *C. baileyana* (Domin) Domin.

The Australian species of *Cyathea* occur in the coastal gullies and mountain rain forests of the dividing ranges but do not extend to the arid inland regions of the mainland. Several species are found only in the north-east of Queensland, i.e., *C. rebeccae, C. baileyana, C. celebica, C. woollsiana* and *C. robertsiana* but *C. cooperi* (Hook. ex F. Muell.) Domin extends from the South Coast of New South Wales to the Cairns-Cooktown district of Queensland. Perhaps the commonest species of tree-fern is *C. australis* whose distribution ranges from Tasmania to south-eastern Queensland; it is abundant in New South Wales especially in the Blue Mountains. *C. grevilleana* is recorded only from Mt. Lindsay on the border of New South Wales and Queensland, whereas *C. marcescens* is also of limited distribution, i.e., from a few localities in Victoria. Of the two remaining species, *C. cunninghamii* occurs in Victoria and Tasmania, whereas *C. leichhardtiana* (F. Muell.) Copel. has quite a wide range from Bruthen, Victoria, to the Eungella Range, near Mackay, Queensland.

Special attention has been paid in the descriptions of the species to the types of scales and hairs occurring on the costae, costules, rhachises and laminas (Pl. XI, XII and XIII), since these features are remarkably constant and distinct in each species of *Cyathea,* even where the details of the leaf structure are very similar. These characters were overlooked by most of the earlier botanists when describing the Australian tree-ferns. The costular scales and hairs are particularly important in identifying herbarium specimens, when the scales of the bases of the stipes have not been collected. The pinnae of *C. australis* and *C. cooperi* are usually so alike macroscopically that misdeterminations in herbarium collections are frequent. However, a glance at the scales of the costules with a lens or with the low power of the microscope shows that the scales of *C. australis* are bullate and entire, slightly fimbriate or denticulate (Pl. XII, fig. 3), whereas those of *C. cooperi* are substellate, i.e., they

HERBARIUM
South Yarra
S.E. 1

[illegible] spinules (Pl. XI, fig. 1). These two species may be readily distinguished in the field, because the bases of the stipes are persistent in *C. australis* but they are nearly always deciduous in *C. cooperi.* Also the scales of the bases of the stipes are bright brown and coriaceous in *C. australis,* whereas two kinds of paleae are strikingly combined in *C. cooperi,* i.e., large, white, papery scales and narrower dark red or brown ones. Three species which have been frequently confused in herbaria are *C. medullaris* (Forst. f.) Sw., of New Zealand, *C. cunninghamii* and *C. marcescens,* although the laminal indumentum is very distinct in each species.

There is a good deal of variation in the kind of scales occurring at the bases of the stipes in the Australian species (Pl. XIV, XV), but the type of scales is very constant in each species with the exception of *C. cunninghamii,* where they vary from fawn, thin and papery to dark brown, glossy and thick on a single stipe. In three species discussed in detail below, these scales are white to pale stramineous and rather thin, but in the bulk of Australian species the scales are black or dark brown, varying from almost woody with a spine-like apical portion in *C. woollsiana* to glossy and coriaceous in *C. australis* and *C. marcescens.* In *C. baileyana* these scales are black, dark purple or dark brown with a long, hair-like process but in *C. rebeccae* they are brownish-purple, thick and fibrillose.

The persistence or dehiscence of the old bases of the stipes on the trunks is a very useful character in the field. These bases are persistent in *C. australis, C. marcescens, C. cunninghamii, C. leichhardtiana, C. rebeccae* and *C. baileyana.* The trunks are covered with smooth, tessellated leaf-scars in *C. cooperi, C. robertsiana* and *C. woollsiana.**

There are several well-defined groups of species amongst the Australian Cyatheas but I shall only briefly indicate them in the introduction, as they are discussed in detail in the text. Both *C. baileyana* and *C. rebeccae* belong to the large group of *C. recommutata* Copel. which ranges from India to Fiji. Two closely related species, *C. australis* and *C. marcescens,* are characterized by glossy, bright brown scales at the bases of the persistent stipes and small fawn, bullate scales on the costae and costules. Both *C. celebica* and *C. leichhardtiana* belong to a well-marked group of species occurring in Australia, Malesia and the Pacific Islands, two other members being *C. truncata* (Brack.) Copel. and *C. tripinnata* Copel. All are characterized by aculeate stipes with white, pale stramineous or light yellow-brown scales at their bases and by atropurpureous, usually squamulose rhachises. The fronds are dark green and 3-pinnate throughout or at the base. In each case the scales of the costules are provided with red or purple, marginal spinules. The indusia are thin, whitish, pale stramineous or fawn, cupuliform or consisting of a ring of scales.

None of the Australian species have dimorphic fertile and sterile fronds. Although there is quite a large group of such species in New Guinea, so far none of them have been recorded from Australia.

In the Australian species of *Cyathea* there are oval scar-like pneumatodes (ventilating areas) at the attachment of the primary pinnae to the main rhachis. These objects are very prominent in *C. australis, C. rebeccae, C. baileyana, C. woollsiana, C. cunninghamii* and *C. cooperi.* They often occur in a double row along the ridges bearing the primary pinnae in *C. australis* and *C. rebeccae,* whereas in *C. leichhardtiana* and *C. robertsiana* these scar-like objects are small and appear to be restricted to the vicinity of the junction of the primary pinnae with the main rhachis. These "scars" are poorly developed in the group of *C. tripinnata-C. truncata* of which *C. leichhardtiana* is a member, and are hidden by the dense vestiture of scurfy squamules.

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* For *C. woollsiana,* see footnote p. 345.

CITATION OF SPECIMENS.

The following abbreviations for herbaria are used in the citation of specimens which have been examined—

K., The Herbarium, Royal Botanic Gardens, Kew, England.
BM., British Museum of Natural History, South Kensington, England.
P., Muséum d'Histoire Naturelle, Laboratoire de Phanérogamie, Paris, France.
BR., Jardin Botanique de l'État, Brussels, Belgium.
GH., Gray Herbarium, Harvard University, Mass., U.S.A.
MO., Missouri Botanical Garden, St. Louis, Mo., U.S.A.
UC., Dept. of Botany, University of California, Berkeley, Cal., U.S.A.
L., Rijksherbarium, Leiden, Netherlands.
W., Naturhistorisches Museum, Vienna, Austria.
NSW., National Herbarium, Sydney, New South Wales.
MEL., National Herbarium, Melbourne, Victoria.
BRI., Botanic Museum and Herbarium, Brisbane, Queensland.
SYD., Dept. of Botany, University of Sydney, N.S.W.
HO., Dept. of Botany, University of Tasmania, Hobart, Tasmania.
U. SING., Dept. of Botany, University of Malaya, Singapore.
CAIRNS, North Queensland Naturalists' Club, Cairns, Queensland.

KEY TO THE AUSTRALIAN SPECIES OF CYATHEA.

1) Mature fronds 2-pinnate (if lobed the secondary pinnae never dissected more than half way to the costa). Costules bifurcating several times below the middle of each secondary pinna, with up to 9 parallel branchlets. Sori exindusiate.

2) Lower pinnae metamophosed into wig-like outgrowths (aphlebiae). Simple veinlets usually alternating with the branched veins .... *C. baileyana* 1.

2*) Lower pinnae normal. Simple veinlets very rarely alternating with the branched veins .... *C. rebeccae* 2

1*) Mature fronds 2-pinnate-pinnatifid to 3-pinnate-pinnatifid (if 2-pinnate-pinnatifid the secondary pinnae dissected more than half way to the costa). Costules branched pinnately throughout their length, the branchlets not parallel to the costule. Sori indusiate.

3) Indusium of the mature sori cupuliform or bivalvate, wholly enclosing the young sori.

4) Lower surface of the secondary rhachises atropurpureous or dark red-brown. Lower surface of the pinnae with a dense, white, cobwebby tomentum and a few yellow or white scales with red, marginal setae .... *C. celebica* 3.

4*) Lower surface of the secondary rhachises yellow-brown, light stramineous or fawn. Lower surface of the pinnae sparsely clothed with stellate hairs and/or bullate scales with a stellate apex, amongst the other paleae; never arachnoid.

5) Lower surface of the minor veinlets clothed with numerous stellate hairs and scales and also with a few linear scales. Fronds 3-pinnate at the base, usually with deeply lobed tertiary segments .... *C. cunninghamii* 4.

5*) Lower surface of the minor veinlets clothed with unbranched hairs and with bullate scales bearing an apical tuft of spinules. Fronds 3-pinnate .... *C. grevilleana* 5.

3*) Indusium of the mature sori incomplete, composed either of a basal persistent hemispherical scale subtending the sorus or of long, appressed, silky strands or scales surrounding or partly surrounding the sorus.

6) Lower surface of the pinnae and costae villous, clothed only with unbranched, bulbous-based hairs. Fronds 2-pinnate-pinnatifid with very deeply lobed tertiary segments .... *C. robertsiana* 6.

6*) Lower surface of the pinnae and costae clothed with scales and occasionally *also* with a few stellate or unbranched hairs.

7) Indusium of the mature sori consisting of a persistent basal scale which does not split into long strands.

8) Costules and minor veinlets clothed with stellate hairs and scales as well as a few bullate scales often with a stellate apex. Scales of the base of the stipe fawn, light to dark brown .... *C. cunninghamii* 4.

8*) Costules and minor veinlets clothed with fimbriate scales some of which bear a few red, marginal spinules. Scales of the base of the stipe bright brown or dark brown.

9) Fronds 2-pinnate-pinnatifid or very rarely 3-pinnate. Scales of the base of the stipe woody, terminating in a long, hard, spine-like apical portion ....*C. woollsiana* 7.

9*) Fronds 3-pinnate. Scales of the base of the stipe thinly to thickly papyraceous, terminating in a long, often twisted, hair-like apical portion. .... *C. marcescens* 8.

7*) "Indusium" of the mature sori composed of long, silky strands and/or dendriform or substellate scales.

10) Scales of the costae bullate, the margin of the scales entire or with long, white or fawn fimbriae and/or with 1 to 4 dark red spinules. Scales of the bases of the stipes bright brown, glossy and coriaceous. Old bases of the stipes persistent .... *C. australis* 9.

10*) Scales of the costae never bullate, the margin of the paleae setose throughout their length with very numerous red, brown, purplish or white marginal spinules.

11) Lower surface of the secondary rhachises atropurpureous or sometimes bright red-brown, aculeate with short sharp prickles, densely clothed with grey or fawn squamules which are visible to the naked eye. Scales of the bases of the stipes pale stramineous to almost white. Old bases of the stipes persistent on the caudex except for a few .... *C. leichhardtiana* 10.

11*) Lower surface of the secondary rhachises fawn, yellow-brown, light stramineous or brown, covered with numerous obtuse protuberances, the squamules not visible without a lens. Scales of the bases of the stipes of two types, i.e., broad, white or pale stramineous paleae and narrower, dark red scales. Old bases of the stipes not persistent on the caudex ..... *C. cooperi* 11.

PART 1.

SUBGENUS **Gymnosphaera** (*Bl.*) *Tindale* comb. et stat. nov., based on *Gymnosphaera* Bl., Enum. (1828), 242.

SYNONYMS: *Gymnosphaera* sensu Copel. in Genera Filicum (1947), 98, sections *Eugymnosphaera* and *Thysanobotrya*, excluding Copeland's Group 3; *Thysanobotrya* v. A. v. R. in Bull Bot. Jard. Buit., II, No. 28 (1918), 66; section *Gymnosphaera* J. Sm., Hist. Fil., (1875), 250.

Tree-ferns with an erect or rarely scandent caudex. *Axes* black, purple or brownish-purple, rarely brown as in *Cyathea gracillima* Copel. *Stipes* clothed at the base with rather appressed, dark brown scales having pale brown, friable borders of thin-walled cells, without a row of marginal spinules, although 1 to 4 dark red setae may be present at the apexes. *Fronds* dark green, subcoriaceous or coriaceous, mostly bipinnate or tripinnatifid, rarely pinnate to tripinnate, uniform or very dimorphic. *Aphlebiae* often present on the lower portion of the stipe, ranging in different species from highly decompound to reduced, spine-like pinnae. *Veins* free, simple, bifurcate or 3- to 12-jugate. *Costae* usually clothed with more or less bullate scales having a dark brown, central, longitudinal band, a pale fawn border and a few, elongated, dark red, terminal spinules or sometimes the scales pale with ciliate margins (as in *C. schlechteri* (Brause) Domin of New Guinea). *Sori* exindusiate or very rarely with a hemitelioid indusium, the paraphyses of various types. *Sporangia* pyriform, the pedicel short, the annulus oblique, composed of 14 to 20 thick-walled cells and 8 to 12 flattened cells including a broad stomium.

HOLOTYPE: *Cyathea glabra* (Bl.) Copel., of tropical Asia.

I have included the species cited by Copeland in his groups 1 and 2 of *Gymnosphaera* Bl. in Genera Filicum (1947), 98-99, as well as *C. kingii* (Clarke ex Bedd.) Copel. which he included in group 3, although the axes of this species are black or atropurpureous and the scales of the stipes and costules are typical of the subgenus *Gymnosphaera* as described above. Another group of species has also been added, seven of these being listed as *Gymnosphaera* in Tardieu-Blot's "Flore de Madagascar et des Comores" (1951), 33-41. They are *Cyathea alticola* (Tard.) Tindale **n. comb.** (syn. *Gymnosphaera alticola* Tard. in Naturaliste Malg., III (1951), 76); *Cyathea malegassica* Domin (syn. *Alsophila madagascarica* R. Bonap., Notes Ptérid., V (1917), 53), non *Cyathea madagascarica* R. Bonap., 1917; *Cyathea andohahelensis* (Tard.) Tindale **n. comb.** (syn. *Alsophila andohahelensis* Tard. in Bull. Soc. Bot. Fr., LXXXVIII (1941), 683); *Cyathea melanotricha* (Tard.) Tindale **n. comb.** (syn. *Alsophila melanotricha* Tard. in Bull. Soc. Bot. Fr., LXXXVIII (1941), 684, pl. II f. 2-3); *Cyathea melleri* (Bak.) Domin; *Cyathea coursii* (Tard.) Tindale **n. comb.** (syn. *Alsophila coursii* Tard. in Bull. Soc. Bot. Fr., LXXXVIII (1941), 684, pl. II, f. 1) and *Cyathea bullata* (Bak.) Domin, Pterid., (1929), 262 (syn. *Alsophila bullata* Bak. in Journ. Linn. Soc., XV (1877), 412); *Gymnosphaera boivinii* (Mett.) Tard., in Tard., Fl. Madag., (1951), 41). I have also included *Cyathea nicklesii* (Tard. et Ballard) Tindale **n. comb.** (syn. *Gymnosphaera nicklesii* Tard. et Ballard in Mus. Natl. Hist. Nat. Notulae Syst., XIV, 4 (1952), 32~~8~~). 9

I have omitted from the subgenus *Gymnosphaera* the group of *C. squamulata* (Bl.) Copel. (i.e., group 3 of *Gymnosphaera* sensu Copeland), as I consider that it forms a connecting link with the exindusiate species of *Cyathea* on one hand and with *Schizocaena* J.Sm. on the other hand. As pointed out by G. P. De Wolf, Jr., in correspondence, the scales of the bases of the stipes in the species of the *C. squamulata* group are medium brown or light castaneous, rarely pale stramineous and there is a row of numerous, dark red or brown, marginal setae, just as in *Schizocaena*. They also occur in a number of species of *Cyathea* (e.g., *C. elmeri* (Copel.) Copel., etc.). The axes of the *C. squamulata* group are brown instead of black or purplish, as in the subgenus *Gymnosphaera*, although they are brown in *C. gracillima* Copel. and sometimes red-brown in *C. podophylla* (Hook.) Copel. and *C. handcockii* Copel. (syn. *Gymnosphaera denticulata* (Bak.) Copel.) which are considered to be members of this subgenus. Brown axes are typical of *Schizocaena* and many species of *Cyathea.* In subgenus *Gymnosphaera* the sori are large and exindusiate (except *C. melleri* of Madagascar which has a hemitelioid indusium), whereas in *Schizocaena* they are mostly protected by thin, cupuliform indusia which break into fragments.

Two of the North Queensland species, viz., *C. rebeccae* and *C. baileyana,* belong to the subgenus *Gymnosphaera.* Both are members of the group of *C. glabra* (i.e., group 1, section *Eugymnosphaera* of *Gymnosphaera,* as defined by Copeland in Gen. Fil. (1947), 98), since their fronds are non-dimorphic and the axes are atropurpureous, dark red or dark brown. *Cyathea vexans* (Cesati) C. Chr., of Borneo, appears to be the most closely allied to *C. rebeccae.* The scales on the main rhachis are fibrillose as in the latter species but the costal scale of *C. vexans* are light fawn with dark red, marginal and apical spinules. Both species have dark green, bipinnate fronds.

The small, more or less bullate costal scales in *C. rebeccae* and *C. baileyana* are of the type commonly found in subgenus *Gymnosphaera,* i.e., they are brown or fawn with a darker brown, central, longitudinal band and 1 or 2 long, dark red, terminal spinules. In the Kew Herbarium I have found similar scales on the costae of *Cyathea recommutata* Copel., *C. ramispina* (Hook.) Copel., *C. formosana* (Bak.) Copel., *C. hewittii* Copel., *C. handcockii* Copel., *C. kingii* (Clarke ex Bedd.) Copel., *C. atropurpurea* Copel., *C. melanoclada* Dom., *C. biformis* (Ros.) Copel., *C. hornei* (Bak.) Copel. and *C. glabra* (Bl.) Copel.

Both *C. rebeccae* and *C. baileyana* are characterized by very dark brown, glossy scales at the base of the stipes. These paleae have a light brown border of cells which are almost at right angles to the broad, central, longitudinal band of dark brown, thick-walled cells. These fawn cells readily flake off and are best seen on the young, circinnate fronds. There is never a marginal row of numerous, dark red or purplish spinules along the margin of these scales, as occur in many species of *Cyathea,* including *C. cooperi, C. celebica* and *C. leichhardtiana,* although a few, scattered spinules may be found towards the apex in some cases. Glossy, dark brown paleae with a pale, friable border are typically found at the base of the stipe in subgenus *Gymnosphaera* (as defined in this paper), but they are by no means confined to this subgenus, e.g., they are characteristic of *C. brevipinna* Bak. ex Benth. of Lord Howe Island, *C. vieillardii* Mett. of New Caledonia, *C. grevilleana* of Jamaica and Australia and *C. marcescens* of Victoria (rather larger scales). None of these species appear to be very closely related to the members of subgenus *Gymnosphaera* according to evidence from the indusia and costal scales.* In fact both *C. marcescens* and *C. vieillardii* have hemitelioid indusia and those of *C. brevipinna* and *C. grevilleana* have cupuliform indusia. In *C. cunninghamii,* of New Zealand and Australia, there is a friable margin on the scales which vary from very dark brown to pale stramineous with a narrow brown central band but a few blackish spinules occur on their bases and apices. The scales of the stipe in *C. australis* (Australia) and *C. dealbata* (Forst. f.) Sw. (New Zealand) are a brighter brown, much longer and more spreading than in subgenus *Gymnosphaera* but there is a fawn, friable margin present in both species.

Aphlebiae are absent in *C. rebeccae* but decompound, feathery aphlebiae are found towards the base of the stipes in *C. baileyana,* similar to those of *C. hewittii* Copel. (Borneo) and *C. hornei* (Bak.) Copel., of Fiji. Various types of aphlebiae occur in the subgenus *Gymnosphaera,* including spine-like, reduced pinnae in both *C. ramispina* (Hook.) Copel., of Borneo, and *C. recommutata* Copel., of Malaya and Borneo. In *C. atropurpurea* Copel., of the Philippines, there are some very reduced pinnae almost without the lamina but they do not become spine-like. Highly decompound aphlebiae also occur in other groups of species in *Cyathea,* e.g., in *C. grevilleana* which has cupuliform indusia and in *C. capensis* (L. f.) Sm. with hemitelioid indusia and markedly bullate, fawn or brown scales interspersed with a few, linear, fawn paleae ending in a dark red spinule (South African material). In Brazilian specimens of *C. capensis,* e.g., Brade 17091 and 20629, Rosenstock 270 and Campos Porto 3033, the scales of the costae are dark red, narrow ovate, lanceolate or linear with fawn borders and dark red, apical spinules just as in *C. baileyana.* Some of the costal scales in Jamaican specimens of *C. grevilleana* are rather similar with a dark red, central band, fawn furfuraceous border and dark red, marginal spinules. Perhaps the relationship of these species to the subgenus *Gymnosphaera* is closer than it appears to be at first.

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* Except in Jamaican specimens of *C. grevilleana* where the coastal scales resemble those of subgenus *Gymnosphaera.*

1. **Cyathea baileyana** (Domin) Domin, Pterid., (1929), 262, and Acta Bot. Bohem., IX (1930), 96; D. A. Goy in Queensl. Nat., XII, 3 (1943), 43, f. 2.

Habitat rain forests. *Habit* arborescent; caudex 2 to 4 m. or more high, seldom more than 5 cm. in diameter, reddish or dark-coloured. *Stipes* not winged, sulcate above, brown or dark red, with 2 rows of slit-like aerophores, tuberculate, shortly appressed to the trunk for a few cm., clothed along the groove with a tuft of black, dark purple or dark brown, metallic scales mostly 1 to 2.5 cm. long and up to 2 mm. broad, terminating in a hair-like process up to 1.6 cm. long and often twice as long as the broad basal portion of the scale, the margin of the scales brown, fimbriate or irregular due to the flaking off of the thin-walled cells. *Primary and secondary rhachises* brown or dark red, trisulcate above, tuberculate, with rounded protuberances, the grooves clothed with the same type of fibrillose scales as on the stipes, also bearing a few, fawn squamules and a few, ovate, lignified scales; densely clothed on the upper surface with red, strigose hairs intermixed with white, yellow and fawn strigose hairs; primary rhachises bearing at the base the metamorphosed lower pinnae which are rigid, fibrous, intricately branched, brown, fawn, green or purple aphlebiae often appressed to the rhachises. *Costae* clothed towards the base on the upper surface with red hairs and below with a few, dark red or purplish, narrow ovate, lanceolate or linear scales often with fawn borders and dark red apical spinules (Pl. XI, fig. 5); towards the apex of the pinnae the scales of the costae fawn, fimbriate and more bullate, terminating in dark red spinules or in a long, fibrillose portion. *Fronds* bipinnate, 2 to 3 m. long, coriaceous, glossy (when fresh), dark green, the lower surface paler. *Primary pinnae* stalked, the petiolules often elongated, the middle pinnae about 60 cm. long and 16 to 22 cm. broad, oblong (3:1) or lanceolate-oblong (3:1), the lower pinnae often broadly elliptical (3:2) or oblanceolate (3:1), the apical segment long-acuminate. *Secondary pinnae* shortly but distinctly stalked, the petiolules articulate on the costae and only the upper winged; usually 4 to 25 pairs, all alternate or the lower pairs opposite, all widely spaced, the upper and middle pinnules narrowly lanceolate (6:1), the lower pairs often narrowly ovate (2:1) or oblong (2:1); usually the upper and middle pinnules 5 to 11 cm. long and 1.3 to 2 cm. broad, the lower pinnules smaller, the apex long-acuminate except in the lower pinnules where it is acute, the margin of the pinnules minutely and irregularly serrulate towards the base or notched at intervals, the attenuated apical portion regularly serrate, these serrations usually extending from the apex for a quarter to half the length of each pinnule, the upper portion of the base truncate, the lower side often prominently auriculate, the lamina glabrous or rarely with a few, scattered, fawn, bullate scales with long, fibrillose apices or terminal red spinules. *Minor veinlets* transverse, forked, mostly with 3 or 4 parallel branchlets (except the basal pair which often have 7 or 8 branchlets), simple veinlets usually alternating with the branched ones, glabrous or rarely bearing on the lower surface a few, fawn, bullate scales with fimbriate margins and fibrillose apices. *Sori* non-indusiate, orbicular, about 1 to 1.25 mm. in diameter, much elevated, crowded in two or three irregular rows, the inner row situated about half way between the midrib and margin on the simple veins and on the outer branchlets of the minor veinlets, the outer row or rows situated on the inner branchlets. *Receptacle* large, globose, dark, minutely grey-furfuraceous, with an apical tuft of ovate to broadly ovate, hyaline, clathrate scales. *Paraphyses* few, fawn or reddish, not prominent, consisting of a single row of cells with red septae, shorter than the sporangia. *Sporangia* pyriform, with a complete, oblique annulus consisting of 15 to 20 thick-walled cells and 8 to 10 thin-walled cells including the stomium, the pedicel short and thick. *Spores* tetrahedral, trilete, smooth when immature, later very papillose, 32 to 37.5 μ x 37.5 to 46 μ (polar diam. by the largest equatorial diam.)*. (Plate IX).

Distribution: North-eastern Queensland, in mountain rain forests usually at altitudes of 3,000 to 4,000 feet above sea level.

Holotype: Bellenden-Ker, in a deep rocky gully at Palm Camp, elevation about 4,000 ft., F. M. Bailey, 1889 (BRI.), (examined). This specimen was cited by Bailey as the Type of *Alsophila rebeccae* F. Muell. var. *commutata* F. M. Bail. in Syn. Queensl. Fl., Suppl. III (1890), 91, and by K. Domin as the Type of *Alsophila baileyana* in Bibl. Bot., LXXXV, 1 (1914?), 29. Isotype (BM.).

Specimens Cited: *North Queensland*: Mt. Spurgeon, in rain forest, rather rare but *C. rebeccae* very abundant, C. T. White No. 10626, 9.1936 (BRI.; BM.); Platypus Creek (a tributary of the Upper Mossman on Mt. Spurgeon, 4,000 ft. alt.), jungle, brown ramenta disposed about petioles, C. T. White, 20.9.1936 (CAIRNS 2303); Brooklyn Track, near Mt. Lewis Clearing, T. Carr, 31.1.1941 (CAIRNS 7248); Bellenden-Ker, F. M. Bailey (NSW. P249); Bellenden-Ker Expedition, F. M. Bailey (BRI.); Bellenden-Ker, eastern slope, 3,000 ft. alt., C. T. White, 1.1923 (BRI.); Herberton, R. F. Waller, 1908 (NSW. P746); Queensland, Bailey, received in 12.1891 (K.); Jensen's Creek, Evelyn Highway, 3,500 ft. alt., in rain forest, aphlebiae bright green at first, developed early, up to 9 ft. high, P. R. Messmer, 1.9.1954 (NSW. P6923; BM.).

Absolute Synonym: *Alsophila baileyana* Domin in Bibl. Bot., LXXXV, 1 (1914?), 29; Watts in Proc. Linn. Soc. N.S.W., XXXIX (1914), 1915, 769; C. Chr., Ind. Fil., Suppl. Prél., (1917), 4.

Equivalent Synonym: *Alsophila rebeccae* F. Muell. var. *commutata* F. M. Bail., Syn. Queensl. Fl., Suppl. III (1890), 91; F. M. Bail., Lith. Ferns Queensl. (1892), t. 33; F. M. Bail., Queensl. Fl., VI (1902), 1948, Holotype, the same as for *Cyathea baileyana*.

F. M. Bailey in Rep. Gov. Sci. Exped. Bellenden-Ker Range (1889), 74, referred this species to *Alsophila capensis* J.Sm. but this was based on a misidentification. *Cyathea baileyana* differs from *C. capensis* (L. f.) Sm., of South Africa, as follows:

C. baileyana.	*C. capensis.*
1) Sori non-indusiate.	1) Sori indusiate.
2) Secondary pinnae entire and undivided.	2) Secondary pinnae deeply divided almost to the costa into very numerous segments.

However, both species possess intricately branched aphlebiae on the lower part of their stipes. In each case the lamina is reduced, leaving the costules intact. In *C. baileyana* the costules of the aphlebiae have a peculiar flexuose appearance.

C. baileyana is very closely related to *C. rebeccae* which also occurs in the dense rain forests of north-eastern Queensland. In fact F. M. Bailey regarded this species as a variety of *C. rebeccae*. However, as indicated in the general key to the Australian species of *Cyathea*, aphlebiae are absent in *C. rebeccae* and the simple veinlets rarely occur between the branched veinlets in the secondary pinnae of the latter species. The pinnules of *C. baileyana* are longer and broader than those of *C. rebeccae*.

2. **Cyathea rebeccae** (F. *Muell.*) Domin, Pterid., (1929), 263, and in Acta Bot. Bohem., IX (1930), 153; D. A. Goy in Queensl. Nat., XII, 3 (1943), 43.

Habitat lowland and mountain rain forests, in gullies and on ridges. *Habit*

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* The spores were boiled in a 10% solution of KOH for two minutes and mounted in glycerin before measurements were taken. This technique was used for the spores of each species of *Cyathea*.

arborescent, the caudex 2 to 6 m. high, 2.5 to 10 cm. in diameter, "covered with oval pits, several on the ridge between the attachment point of each frond", the crown loose, consisting of about 8 fronds, the adventitious roots only present for a few inches along the thickened base. *Stipes* (Pl. XV) not winged, appressed to the caudex, persistent for a considerable time to at least half-way down the caudex, with two rows of oval pits, sulcate above, dark red or reddish-purple, densely clothed with fawn, appressed, irregularly fimbriate squamules often with a dark red or brown central spinule, scabrous with rounded tubercles which are 0.1 to 0.2 mm. long, clothed at the base with scales which are brownish-purple, with friable fawn margins, thick, glossy, subtortuous, fibrillose, cultrate (9:1) to linear (over 12:1), usually 7 to 15 mm. long and 0.1 to 1 mm. bread at the base. *Primary rhachises* bearing small, dehiscent pinnae almost to the base, the lower 60 to 90 cm. of its length soon bare; upper surface clothed with dark red-brown or brownish-purple, linear (more than 12:1) to lanceolate (3:1) scales which are mostly 0.6 to 1.2 cm. long and 0.1 to 0.3 mm. broad, with entire fawn margins or a few, dark red, marginal spinules; white or fawn squamules (often at the base of the above scales) and red or brown, curved hairs also present on the upper surface; lower surface glabrous or with a few, white, brown or fawn squamules often with a dark red central spinule. *Secondary rhachises* clothed on the upper surface with red, fawn or brown, jointed, crispate-strigose hairs along the groove, also with a few white or fawn squamules together with spreading, linear (more than 12:1), fibrillose, dark red or brownish-purple, entire scales and a few, fawn or whitish, lanceolate scales with red, marginal spinules and often with a darker central band; lower surface of secondary rhachises scabrous and usually clothed with whitish or brown squamules which often have a central, dark red or purple spinule. *Costae* without strigose hairs but clothed on the upper surface at the base with a few, red-brown, fibrillose scales and white or fawn squamules and clothed on the lower surface towards the base with a few, large, dark red scales with dark red, marginal spinules and furfuraceous bases, towards the apex and middle of the lower surface with fawn or brown, sub-bullate scales having a central red-brown band, a whitish or pale fawn border, whitish, filiform, marginal processes and a long, dark red, terminal spinule (Pl. XI, fig. 2). *Fronds* bipinnate, rarely the secondary pinnae deeply lobed, coriaceous, glossy (when fresh), dark green, the lower surface a paler green, 2 to 3 m. long. *Primary pinnae* stalked, the petiolules often elongated; middle pinnae up to 60 cm. long and 7 to 17 cm. broad, narrow oblong (3:1) or some of the lower pinnae narrowly elliptical (3:1) or elliptical (2:1), the apical segment long-acuminate. *Secondary pinnae or pinnules* shortly but distinctly stalked, the petiolules articulate on the secondary rhachises, only the upper petiolules winged, 9 to 35 pairs, alternate, widely spaced, narrowly lanceolate (6:1) to lanceolate (3:1) or narrowly lanceolate-cultrate (6:1) to lanceolate-narrow-oblong (3:1); lower pinnules sometimes narrowly ovate-oblong (2:1), 2.5 to 8.5 cm. long, 0.6 to 2 cm. broad, the sterile pinnules broader than the fertile segments, the apex long-acuminate except in the lower pinnules where it is acute to broadly rounded, the margin of the pinnules very variable, entire or serrate-crenate throughout or irregularly lobed near the base and crenate-serrate towards the apex. *Veins* transverse, forked, usually with 3 to 5 parallel branchlets, except the basal pair of which each vein often has 7 to 9 branchlets, free veinlets very rarely present between the branchlets; usually glabrous above or with a few squamules, almost glabrous below or with scattered, brown or fawn, lanceolate to very broadly ovate scales with irregular, filiform, marginal processes, long-acuminate apices and occasionally with a few, dark red spinules. *Sori* non-indusiate, orbicular, about 0.75 to 1.25 mm. in diameter, much elevated, crowded in two irregular rows, the inner row about half way between the midrib and margin, situated on the outer branchlets of the minor veinlets, whereas the outer row of sori is borne on the inner branchlets. *Receptacle* large, globular or columnar, dark, minutely grey-furfuraceous, with an apical tuft of caducous, clathrate scales. *Paraphyses* numerous, fawn or reddish, consisting of a single row of cells, usually shorter than the sporangia. *Sporangia* pyriform, with a complete, oblique annulus of 16 to 19 cells and 8 to 10 flattened cells including the broad stomium, the pedicel short and thick. *Spores* tetrahedral, trilete, smooth when immature, later papillose, 34 to 52.5μ x 34 to 52.5μ

Distribution: North-eastern Queensland.

Holotype: Sea Coast Range . . . small tree-fern high up in a gully at the base of the range, the stem is about 6 ft. high and not more than an inch in diameter . . . , J. Dallachy, 8.1.1865 (MEL., seen). In Fragm. Phyt. Austr. V (7.1865), 53, Mueller cited the distribution of this species as "in irrigated valleys at Rockingham's Bay, Dallachy". The trunk is described as being 6 ft. high and not more than one inch in diameter, so that the above mentioned specimen was probably in Mueller's possession when he made the description of this species. In the National Herbarium, Melbourne, there is also a specimen of *C. rebeccae* collected at the Coast Range, Rockingham's Bay by J. Dallachy on the 22nd February, 1864, which could be considered as part of the type collection.

Specimens Cited: *North Queensland*: tableland behind Cooktown, alt. 2,000 ft., tree-fern 15 ft. high including the crown, narrow caudex, some bases of the stipes persistent, P. R. Messmer, 26.7.1952 (NSW. P2356); Daintree River, rain forest, L. J. Brass No. 2228 N.Q. plants, 2.3.1932, "tree-fern, the trunk of a large specimen measured 12 ft. to the crown with a diameter of scarcely 2 inches. No adventitious roots except on a few inches of the thickened base. Stem marked with oval pits, several on the ridge between the attachment point of each frond. The appressed leaf bases are persistent for a long time and the remnants still remain near the base of old trees. Crown of about 8 spreading fronds, each 8 ft. long x 3½ ft. broad. The rhachis of a young frond bears small pinnae almost to the base. These soon fall, leaving the lower 2 or 3 feet bare. Rhachis covered on the flattened upper side with long, flat scales. The lower surface densely mealy. This species extends from the river flats to the summit of Thornton Peak—an altitude range of 4,500 ft." (BRI.); Mt. Spurgeon, tall tree-fern very common everywhere in the damper rain forest, C. T. White No. 10532, 9.1937 (BRI.); Zarda, Root's Creek (now known as Upper Mossman, 4500 ft. above sea level on Mt. Spurgeon), fronds 6 ft. long, tree-fern 8 ft. high, H. Flecker, 5.1.1936 (CAIRNS 1289); Kuranda, alt. 1100 ft. tree-fern with slender trunk, very common in rain forest, D. A. Goy No. 429, 28.7.1938; (BRI.; BM.); Kuranda, W. W. Watts, 7.1913 (NSW. P217, P218, P250 and P252); bank of Campbell's Creek (near Cairns), tree-fern, narrow trunk, about 12 ft. high, upper surface of pinnules glossy, H. Flecker, 27.10.1935 (CAIRNS 941; BRI); bank of Campbell's Creek, H. Flecker, 16.5.1937 (BRI; CAIRNS 3293); Cairns, W. W. Froggatt, 1886-87 (NSW P747, P748, P774 and P775); Cairns, J. E. Tenison-Wood (BRI.); original from Range Road, cultivated by W. Fish at Abbott St., Cairns, 18.1.1937 (CAIRNS 2734); Cairns district, W. W. Watts, 7-8.1913 (NSW P251 and P779); top of Lamb Range above Hambledon, A. Johnson, 21.11.1946 (CAIRNS 10589); Atherton, C. T. White, 1.1918 (BRI.; K.); Gadgarra, Atherton Tableland, rain forest creek, alt. 800 metres, common occurrence, a large fern up to 1¾ metres, growing on creek banks, S. F. Kajewski No. 1103 Flora of Queensland, 8.6.1929 (BRI; K.); Bellenden-Ker, at 1500 ft. altitude, tree-fern 10-20 ft. high, stems 2-3 ins. in diameter, granite, R. H. Cambage No. 3818, 13.8.1913 (NSW P750); between Cairns and Herberton, C. J. Wild, 1891 (BRI.); Allumbah (Herberton), R. F. Waller No. 125, 10.1909 (NSW. P778); Allumbah (Herberton), R. F. Waller, 10.1909 (NSW. P776); Herberton, R. F. Waller, 1908 (NSW. P770, P772 and P788); Mt. Graham, Herbert River, from a young plant, F. M. Bailey (BRI.); Ravenshoe W. W. Watts, 7-8.1913 (NSW. P254); Ravenshoe, Kirkwood 4.6.1945 (CAIRNS 9427); Innisfail, E. Jarvis, 8.1913 (BRI.); Cardwell, C. E. Beddome (BRI.); Rockingham Bay, Dallachy (BRI.); Mt. Spec, Paluma Range, alt. 2925 ft., plentiful on ridges and in gullies, rain forest, on decomposed basalt and granite, K. Kennedy, 15.8.1948 (NSW. P5573); Eungella Range via Mackay, W. D. Francis, 3-12.10.1922 (NSW. P749).

Absolute Synonyms: *Alsophila rebeccae* F. Muell., Fragm. Phyt. Austr., V (7.1865), 53 and (2.1866), 117; Benth., Fl. Austr., VII (1878), 710; F. M. Bail., Lith. Ferns Queensl., (1892), t. 32; F. M. Bail., Syn. Queensl. Fl., (1883), 689; F. M. Bail., Queensl. Fl., VI (1902), 1948; C. Chr., Ind. Fil., (1905), 47; *Alsophila rebeccae* F. Muell. var. *normalis* Domin in Bibl. Bot., LXXXV, 1 (1914?), 28 and 29 fig. 4. Type is a plate, i.e. Hook., Ic. Pl., XI (1867), t. 1015.

Equivalent Synonym: *Alsophila rebeccae* F. Muell. var. *lobulata* Domin in Bibl. Bot., LXXXV, 1 (1914?), 29, Holotype, Bellenden-Ker, F. M. Bailey, 1889 (not examined), also t. 32 in Bail., Lith. Ferns Queensl. (seen).

It is evident from the specimens examined that the two varieties described by Domin intergrade to such an extent that they are not worthy of varietal recognition.

A few of the lower pairs of primary pinnae in *C. rebeccae* are much reduced in size but they are not aphlebioid as in *C. baileyana*.

PART 2.

SUBGENUS **Cyathea.**

SYNONYMS: *Cyathea* Sm. in Mém. Acad. Turin, V (1793), 416; Copel., Gen. Fil. (1947), 95; *Sphaeropteris* Bernhardi in Schrad. Journ., II, 1800 (1801), 122; *Alsophila* R. Br., Prodr. Fl. N. Holl., (1810), 158; *Hemitelia* R. Br., Prodr. Fl. N. Holl., (1810), 158, Obs. 3; *Chnoophora* Kaulf., Enum., (1824), 250; *Disphenia* Pr., Tent. Pter., (1836), 55; *Amphicosmia* Gardner in Lond. Journ. Bot., I (1842), 441; *Dichorexia* Pr., Abh. Böhm. Ges., V, 5 (1848), 344; *Fourniera* Bommer in Bull. Soc. Bot. Fr., XX (1873), XIX; Ann. Sci. Nat., Ser. 5, XVIII (1873), 349.

Tree-ferns with an erect caudex sometimes up to 60 ft. high. *Bases of the stipes* persistent or deciduous, clothed with distinctive scales which range from thin and almost membranous to cartilaginous, dull to glossy, the margin entire or irregular and friable, or with small, often coloured spinules, the apex usually acuminate but sometimes long and spine-like, varying in colour from white or pale stramineous through castaneous to dark brown or almost black; a fine appressed layer of minute, furfuraceous scales often also present. *Stipes* fawn, yellow to dark brown, red-brown, atropurpureous or sometimes black, usually muricate or aculeate, the spines obtuse, acute or pungent, straight or curved; aphlebiae rarely present. *Lamina* lanceolate to broadly ovate, bipinnate to decompound, membranous to thick and chartaceous but mostly coriaceous. *Veins* free; minor veinlets simple, once to twice forked or sometimes pinnate; costae and costules mostly clothed with distinctive scales and/or hairs, these scales varying from flat to bullate, white, pale fawn, brown to dark brown, dark red or atropurpureous, ovate, linear or substellate, the margin entire, lacerate, fimbriate or with spinules, the hairs simple to stellate, sometimes glandlike. *Sori* on the axils of, or dorsal on the veinlets, exindusiate or indusiate, the indusium cupuliform or hemitelioid (semicircular) or consisting of a tuft of scales. *Receptacle* elevated, oval, globular or columnar. *Sporangia* pyriform or cuneate, the pedicel short and thick, consisting of 4 rows of cells, the annulus oblique, the stomium lateral and definite. *Paraphyses* usually present, filamentous, mostly fawn or reddish. *Spores* tetrahedral.

HOLOTYPE: *Cyathea arborea* (L.) Sm. of northern South America and the West Indies.

There are about 800 species, mostly found in the rain forests of the Tropics, Australia, New Zealand, Chile and South America. Nine of the Australian species belong to this subgenus which is by far the largest and most important in the genus.

3. Cyathea celebica *Bl.* Enum. Pl. Jav., (1828), 245; C. Chr., Ind. Fil., (1905), 190; Copel. in Phil. Journ. Sci., IV (1909), 51.

Habitat in rain forests near creeks. *Habit* arborescent, the caudex 15 to 20 ft. 4.6 to 6 m.) high. *Stipes*[*] "dark-coloured, muricated with short, black, sharp spines and clothed with a close whitish or ferruginous tomentum." *Secondary rhachises* dark red-brown to purplish-black, muriculate below with short, sharp, black spines, very densely clothed on the supper surface with narrowly lanceolate to broadly ovate, red or yellowish scales with long, red, marginal spinules as well as with a few, reddish, curled hairs, clothed on the lower surface with deciduous, white or fawn, cobwebby squamules and a few laciniate scales. *Costae* light brown, densely clothed above with yellowish hairs with reddish joints between the cells, together with a few laciniate,

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[*] Quoted from F. M. Bailey's Synopsis Queensl. Fl., (1883), 689.

After this paper had gone to press a collection of *C. celebica* was made by P. R. Messmer at Kidners Creek, head of the Beatrice River, Q., in Sept. 1954 (NSW: P6939), in which the atropurpureous bases of the stipes were not persistent on the trunk. They were covered with black, shiny, curved or straight spines 3 to 6 mm. long and 0.5 to 1.2 mm. wide at the middle. The basal scales were pale stramineous to light yellow-brown, thin, silky, linear, 1.2 to 4 cm. long and 0.3 to 1 mm. broad, their apical and marginal spinules being dark red-brown or purple.

narrowly lanceolate to broadly ovate scales, clothed on the lower surface with white or yellow, broadly ovate scales with long, red, marginal spinules or white fimbriae and also clothed with white or fawn cobweb-like squamules. *Fronds* tripinnate, subcoriaceous, dark green above, whitish below due to a white cobwebby tomentum. *Primary pinnae* with short wingless petiolules, 36 to 40.5 cm. long, 19 to 21 cm. broad, the apex abruptly acuminate. *Secondary pinnae* almost sessile, with wingless petiolules, alternate, widely spaced, cultrate-narrowly lanceolate (6:1), 10 to 12 cm. long, 1 to 2.2 cm. broad, the apex acuminate. *Tertiary segments* sessile, except the lowest 1 to 3 pairs which have distinct stalks up to 1 mm. long; segments not joined at the base except those near the apex of the secondary pinnae, 23 to 27 pairs, alternate, 0.5 to 3 mm. apart, subfalcate, narrowly oblong (3:1), 6 to 11 mm. long and 1.5 to 4 mm. broad, the apex subacute or acute, the margin clothed with white, curled, filiform hairs and serrulate towards the apex but crenulate or deeply lobed towards the base. *Costules* glabrous or almost so above, the lower surface cobwebby-tomentose (arachnoid), towards the base and middle bearing a dense cluster of yellowish, ovate to broadly ovate scales which are reddish towards the apex and have red, marginal spinules (Pl. XII, fig. 1b). *Minor veinlets* partly obscured below by a cobwebby tomentum, branched once to thrice, about 7 to 10 pairs in each ultimate segment, sparsely clothed below with a few, laciniate scales. *Sori* indusiate, orbicular, about 0.5 to 1 mm. in diameter, 2 to 6 pairs per tertiary segment, costular, situated on the lowest or on the only forking of the minor veinlets, clustered towards the centre of the segments. *Indusium* cupuliform, pale fawn or whitish, membranous, delicate, very finely fimbriate, sometimes with red spinules on the margin, breaking into irregular segments. *Receptacle* ovoid or conical, dark, minutely grey-furfuraceous. *Paraphyses* numerous, consisting of a single row of cells with red septae, shorter than the sporangia. *Sporangia* with a very oblique, complete annulus of 16 to 18 thick-walled cells and and 10 to 11 thin-walled cells including the stomium, the pedicel short and thick. *Spores* tetrahedral, trilete, smooth when immature, later papillose.

Distribution: Ternate, Moluccas, Papua, Queensland and Java.

Holotype. Herb. Lugd. Bat. No. 908, 282 .... 632 (L., seen), labelled "*Polypodium giganteum*, Ternate, *Gyathea celebica* Bl." (*C. celebica* is in Blume's writing). Isotype (K.). Unfortunately these speciments are sterile, but the lower surface of the fronds is arachnoid and the costal scales are essentially the same as in *Cyathea arachnoidea* Hook., in Hook. et Bak., Syn. Fil., ed. 1 (24.7.1865), 24. *Cyathea celebica* Bl. appears as a nomen dubium in C. Chr., Ind. Fil., (1905), 190.

Specimens Cited: *Queensland*: Evelyn Scrub, Herberton, R. F. Waller No. 124, 10.1909 (NSW. P782), "stem much shorter, fronds more erect (than *Cyathea leichhardtiana*) and stipes very prickly. Both are from the same creek and grow almost alongside. This is a much finer fern."; Rockingham Bay, ex Herb. F. Mueller, received at Kew in 1877 (1 sterile primary pinna), (K.); Rockingham Bay, ex Herb. Mueller (2 sterile pieces), (P.); Rockingham Bay, ex Herb. Mueller, Herbar. Filic. Luerssen No. 9211 (1 small sterile specimen), (P.); Rockingham Bay, J. Dallachy (MEL.); Coast Range, Rockingham Bay, on the N.W. side of the range in dense scrub, Dallachy, 21.12.1867 (MEL.).

Absolute Synonym: *Alsophila celebica* Mett., Ann. Lugd. Bat., I (1863), 53, based on *Cyathea celebica* Bl.

Equivalent Synonym: *Cyathea arachnoidea* Hook. in Hook. et. Bak., Syn. Fil. ed. 1 (7.1865), 24; F. Mueller, Fragm. Phyt. Austr., VI (1868), 200; Benth., Fl. Austr., VII (1878), 708; F. M. Bail., Syn. Queensl. Fl., (1883), 689; F. M. Bail., Queensl. Fl. VI (1902), 1947; C. Chr., Ind. Fil., (1905), 189; v. A. v. R., Malayan Ferns, (1908), 26; C. Chr., Ind. Fil., Suppl. I (1913), 100; Domin in Bibl. Bot., LXXXV, 1 (1914?), 27; v. A. v. R. in Bull. Jard. Bot. Buit., Ser. III, V, 3 (1922), 192; Domin in Acta Bot. Bohem., IX (1930), 92. Holotype: Ternate, Guil. Henr. de Vriese et J. E. Teijsmann No. 1141, Herb. Itineris in Insulas Moluccanas, 1859-60 (K., seen).

All previous references to *C. celebica* Bl. in Australian literature are under the name of *C. arachnoidea* Hook. in Hook. et Bak. It was first recorded in Australia by F. Mueller in his Fragm. Phyt. Austr., VI (1868), 200, where he cited a specimen collected by Dallachy on "the N.W. sides of the mountains behind the gulf of Rockingham's Bay". The latter region and Evelyn Scrub are the only Australian localities in which this species has been collected." Waller's specimen from Evelyn Scrub differs from Hooker's original description of *C. arachnoidea* in that the ultimate segments are longer, being 4 to 5.5 lines (8.5-11.5 mm.) in length instead of scarcely 3 lines (6 mm.), also the sori in the Queensland fern do not occupy the whole space between the costule and the recurved margin. Otherwise, the rusty tomentum and black spines of the rhachises, the arachnoid lower surface of the lamina, the type of indusium and the scales of the costules agree well with Hooker's description and his type specimen.

The specimen collected at Rockingham Bay in the Kew Herbarium agrees well with the type of *C. celebica* Bl. and other sheets from Ternate e.g. North Foramadiahi, in forest, alt. 1000 m., V. M. A. Beguin No. 1461, 5.3.21 (K.); Ternate, R. H. Beddome's Fern. Herb., presented 1911 (K.); Molukken (Moluccas), Teysm. [-ann], ex Herb. Hort. Bot. Calcuttensis, Herb. Bog. (K.) and Ternate, Moluccas, 2000-4000 ft. alt., tree-fern 15, 20 to 35 ft. in height, a few grow in the outer crater at 4800 ft., Moseley, Challenger Expedition, 10.1874 (K.). The length of the ultimate segments in the specimens from Ternate varies from 6 to 16 mm. and the breadth from 1.2 to 2.5 mm., whereas in the Rockingham Bay material at Kew Herbarium the ultimate segments are usually 6 to 10 mm. long and 1.5 to almost 2 mm. broad. In the specimens from Ternate there are a few, red, marginal spinules on the fimbriate indusia, just as in the material collected in Queensland. Unfortunately the base of the stipe is not present in any of the Australian specimens of *C. celebica.** A description of the Moluccan material is given by van Alderwerelt van Rosenburgh in Bull. Jard. Bot. Buit., Ser. III, V, livr. 3 (1922), 192, under the name of *C. arachnoidea,* where he stated that "Beguin's Nos. 1461 and 1545 from Ternate (North Foramadiahi) have the stipes black or purple black, shortly acutely spinulose, densely rusty-tomentose, the base clothed with crowded, long and fine, subfiliform, glossy, yellow-brown scales". In the Rijksherbarium at Leiden I examined a specimen of *C. celebica* collected at Koitaki, Papua, alt. ca. 1500 ft., on the 25th of April 1935 by C. E. Carr (No. 12047). The scales of the base of the almost black stipe were pale stramineous with red marginal and terminal spinules, and the rather sharp-pointed, narrow spines of the stipe varied from 1.5 to 4 mm. in length. This species was omitted by E. B. Copeland in his "*Cyathea* in New Guinea" in Phil. Journ. Sci., LXXVII, 2 (1947) 95-125, but its occurrence in New Guinea makes the distribution from the Moluccas and Ternate to Queensland more comprehensible.

4. **Cyathea cunninghamii** *Hook. f.* in Hook., Ic.Pl.,X (1854), t. 985; Hook., Cent. Ferns, (1854), t. 85; Ewart, Handb. Forest Trees for Vict. Foresters, (1925), 38; Ewart, Fl. Vict., (1930), 34.

Habitat in deep, shady gullies of cool, moist regions. *Habit* arborescent; caudex up to 20 m. (65 ft.) high, very slender, dark-coloured at the base, the diameter usually 3 to 14 cm. (but up to 46 cm. in trunks about 20 m. high), dead fronds persistent for a considerable time, adventitious roots not forming such a dense matting even at the base of the caudex as in *C. cooperi. Stipes* (Pl. XV) not winged, deeply sulcate above, slender, black or dark-brown, grey-brown when young, very scabrous with rounded or subacute tubercles; bases of the stipes persistent and appressed, clothed with a tuft of scales which vary from fawn, thin, papery, dull or satiny to dark-brown, lustrous and thick, mostly 1.5 to 3.7 cm. long, each broadened base 1 to 3 mm. wide, terminating in an elongated brown, hair-like process, surmounted by a long black spinule, the margins of the scales fawn, friable, very narrow to one-third the width of the scales, entire to slightly erose, with a few, scattered, black, marginal spinules; upper and middle portions of the stipes clothed with dark brown, ovate or irregularly-shaped squamules which often have a tuft of marginal spinules. *Primary rhachises*

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* See footnote page 337.

yellow-brown or stramineous, trisulcate above, tuberculate below with rounded protuberances, clothed densely on the upper surface with simple or sometimes branched, jointed, yellow or red, crispate hairs together with brownish or reddish scales with a terminal tuft of spinules and a few, fawn or brown, linear to lanceolate scales, the lower surface glabrescent or clothed with a few, yellowish, stellate hairs. *Secondary rhachises* pale to bright yellow, more or less tuberculate below, clothed above as on the primary rhachises but the lower surface glabrescent or at first tomentose with numerous, short, fawn, hyaline or yellow, stellate hairs and scales, together with fawn or brown, slightly fimbriate, linear (more than 12:1) to lanceolate (3:1) scales; also clothed at the junction of the pinnules with the secondary rhachises with a few, minute, fawn scales bearing a terminal tuft of red spinules. *Costae* and *costules* clothed above as on the primary rhachises but on the lower surface tomentose with minute, fugacious, hyaline, yellow or fawn, stellate hairs (Pl. XII, fig. 2a) and a few small scales with a terminal tuft of red spinules or fawn fimbriae (Pl. XII fig. 2b) as well as patches of very closely appressed, large, brown, lanceolate (3:1) to broadly ovate (6:5) scales with irregularly fimbriate margins and occasionally with a few, red, marginal spinules, and fawn scales with long fimbriae. *Fronds* 3-pinnate-subpinnatifid or the sterile fronds 3-pinnate, soft, herbaceous to thinly coriaceous, almost membranous in young plants, dark green above, pale green on the lower surface, about 2.4 to 7 m. in length. *Primary pinnae* with wingless petiolules; the upper pinnae erecto-patent, the lower pairs reduced in size and horizontal or deflexed, all pinnae narrowly oblong (3:1) to oblong (2:1), tending to be slightly elliptical, 28 to 64 cm. in length, 6 to 20 cm. in breadth, the apex abruptly acuminate. *Secondary pinnae* sessile or very shortly stalked, usually 19 to 28 pairs, alternate or sometimes opposite, widely spaced, all erecto-patent or the middle and lower pinnae horizontal or deflexed, cultrate-narrowly lanceolate (6:1) to narrowly oblong-lanceolate (3:1), mostly 5 to 9.5 cm. in length and 1 to 2.2 cm. in breadth, the apex abruptly acuminate. *Tertiary segments* sessile except one or two which are close to the secondary rhachis, often incised one-third to halfway to the midrib, usually 12 to 22 pairs, alternate, upcurved except the lowest 1 or 2 pairs which are often spreading, cultrate (6:1) to narrowly oblong (3:1), 0.6 to 1.5 cm. long and 1 to 3 mm. broad, the margin deeply crenate, the apex obtuse and often erose. *Ultimate lobes* rounded, the apex obtuse, bilobed or subacute, the margin flat or recurved. *Minor veinlets* free, bifurcating in the lower and middle ultimate lobes, 4 to 9 pairs per tertiary segment, clothed mostly with stellate hairs and scales. *Sori* indusiate, globular, one to each lobe, 0.5 to 1 mm. in diameter, 1 to 7 pairs per tertiary segment, usually very close to the midrib but occasionally medial, situated on the fork of the minor veinlet of each ultimate lobe. *Indusium* cupuliform, globular at first, enclosing the whole sorus, then splitting into 2 almost equal lobes or sometimes remaining as a hemispherical scale as in *Cyathea marcescens*, fawn to brown or reddish-brown, dark brown towards the base, rather thin, persistent; the margin entire, sinuous or rather irregularly lobed. *Receptacle* elevated, globular or oblong, dark, minutely grey-furfuraceous, with an apical tuft of short, broad, caducous scales. *Paraphyses* few, reddish, consisting of a single row of cells, shorter than the sporangia. *Sporangia* long-cuneate, with a very oblique, complete annulus consisting of 16 to 18 thick-walled cells and 8 to 10 thin-walled cells, the pedicel short and thick. *Spores* tetrahedral, trilete, smooth when immature, later papillose, 33 to 45μ x 43 to 51μ.

Distribution: Victoria, Tasmania, New Zealand and the Chatham Islands.

Type Collection: Three *syntypes* are cited by J. D. Hooker in Ic. Pl., X (1854), t. 985, viz., New Zealand, Forster; Wycari River, Bay of Islands, A. Cunningham and mountains of the East Coast and Interior, W. Colenso. I have chosen as the Lectotype a specimen labelled "New Zealand, Colenso" in the Kew Herbarium, since there is a pencil drawing on the sheet which is reproduced in plate 985 with the original description. This is apparently the specimen cited by Hooker as "mountains of the East Coast and Interior, W. Colenso". The label of this specimen bears a manuscript name of Colenso's which appears to be a nomen nudum. Another SYNTYPE, viz., "Bay of Islands, A. Cunningham, 5.1838" is also in the Kew Herbarium, but I have been unable to trace the specimen collected in New Zealand by Forster.

SPECIMENS CITED: *Victoria*: Mt. Drummer, Gippsland, rain forest in gully below the springs, height 10 ft., fronds 9 ft. long, R. Melville No. 2821 and N. A. Wakefield, 12.1.1953 (NSW. P6415; MEL.; K.); Mt. Drummer, trunk 20 ft. high, 4 inches in diam., fronds 5 ft. long, R. Melville No. 2823 and N. A. Wakefield, 12.1.1953 (NSW. P6416; MEL.; K.); Mt. Drummer, East Gippsland, F. Robbins, 8.1937 (NSW. P692; MEL.); Young's Creek, Orbost, N. A. Wakefield, 6.1940 (MEL.); Lilly Pilly Gully, head of Tidal River, Wilson's Promontory, A. J. Ewart, 29.12.1913 (MEL.); Sassafras Creek, below Kallista, Dandenong Ranges, on a steep hillside soak, under the dense shade of mountain fern gully vegetation, J. H. Willis, 20.9.1950 (NSW.); Dandenong Ranges, F. Mueller, 10.1879 (K.), "scales at the base of the frond stalks very pale"; creek between Arthur's Seat and Cape Schanck, near the entrance of Port Phillip, Mornington Peninsula, 4 ft. high, 2 ins. in diam., remains of the old fronds are on the stem to within a few inches of the ground, J. Baldey, 1883 (MEL.); Apollo Bay district, C. Walter, ex Herb. H. B. Williamson (NSW. P666), young fertile fronds; towards Cape Otway, F. Mueller (NSW. P691) more scales with red spinules than usual; Cape Otway Ranges, stem 20 ft., diameter 8 ins., G. H. Marriner, 1880 (MEL.); Cape Otway Ranges, Wilkinson (K.).

Tasmania: *North-west*: 8 miles from Stanley, near Circular Head, 30 to 41 ft. high, 5½ ins. in diameter, fronds darker and thinner than in other species, fronds in one row and the primary pinnae more at right angles to the stalk than in other species, S. B. Emmett, 1874 (MEL.); Circular Head, S. B. Emmett, ca. 1875 (MEL.); near Circular Head, S. B. Emmett (K.); Circular Head, L. Rodway No. 1064 (HO.); Smithtown, M. Atkinson, 10.1945 (NSW. P785); gully to the east of Britton's Swamp near an old tram line, trunk 50 to 60 ft., diameter 18 ins., ferns and tree seedlings on trunk, slight tubercles on stipes and rhachis, J. Somerville, 28.12.1940 (HO.); near Table Cape, E. D. Atkinson, 1882, ex Aug. Simson collection No. P288 (HO.). *West Coast*: Macquarie Harbour, 1881, ex Herb. F. Mueller (MEL.). *North-east*: Launceston, W. McGowan, 25.7.1890 (MEL.). *South-east*: Waterfall Gorge, below old mill, Murdunna side of Eaglehawk Neck, W. M. Curtis and J. Somerville, 13.1.1944, no old fronds attached but base of rhachis not black and shining but soft greyish-brown (young fertile pinnae) (HO.); Waterfall Gorge, below the old mill on a hill overlooking Eaglehawk Neck, northern side of road, W. M. Curtis and J. Somerville, 13.1.1944 (young fertile pinnae) (HO.); Long Bay, D'Entrecasteaux Channel, Stephens, 1881 (MEL.).

EQUIVALENT SYNONYM: *Cyathea boylei* F. Muell. ex French in Southern Sci. Rec., I, 3 (1881), 33, nomen subnudum, TYPE, Dandenong Range, on a creek running to the south, 25 ft. high, 9 ins. in diam., apparently collected by Boyle, about 1879 (MEL.). There are also several specimens collected by Gessner in 1879 in the Dandenong Range (MEL.; NSW. P693 and P694) labelled *Cyathea boylei* in Mueller's own hand writing.

The vestiture of the fronds in the New Zealand specimens of *Cyathea cunninghamii* is identical with that of the Australian material of this species, although the specimens from New Zealand generally have the lower surface of their secondary rhachises almost free from tubercles.

Cyathea cunninghamii has often been confused with *C. medullaris* (Forst. f.) Sw. In T. F. Cheeseman's "Manual of the New Zealand Flora", ed. 2 (1925), 25, he stated that *C. cunninghamii* is "best distinguished from *C. medullaris*, to which it is closely allied, by the smaller size, more membranous fronds, paler and much less muricate stipes and rhachis, which are more or less clothed with yellowish strigose hairs and by the smaller segments and sori". However, a more reliable method of distinguishing the two species is by the scales which occur on the lower surface of the costules. In *C. medullaris* they are shining, white, red or red and white, with exceptionally long and numerous marginal spinules, whereas in the other species the costules are clothed with minute, hyaline, yellow or fawn, stellate hairs and a few small scales of the same colour with a terminal tuft of red spinules or fawn fimbriae, as well as with scattered patches of closely appressed, large, brown, lanceolate to broadly ovate scales with irregularly fimbriate margins and occasionally with a few, red, marginal spinules, also clothed with fawn scales bearing long, fawn fimbriae

In the Riksmuseum, Stockholm, I examined Forster's specimen upon which Swartz based *Cyathea medullaris*. It is labelled "e collectione Forsteri ex insulas maris pacifici." In Schrad. Journ. Bot., II, 1800, (1801), 94, Swartz cited no specimens but gave *Polypodium medullare* as a synonym.

The only allegedly Australian specimens of *C. medullaris* which I have seen are two sterile pieces collected by Hombron at "Richemond, van Diemen". These are located in the Muséum d'Histoire Naturelle, Paris. This locality may be a mistake, as there is also a town named Richmond near Nelson in the South Island of New Zealand, as well as a Richmond, Tasmania. In Bibl. Bot., LXXXV, 1 (1914?), 27, Domin recorded *C. medullaris* from Victoria, Tasmania and New Zealand but omitted *C. cunninghamii* from the list of Australian ferns. The *"Cyathea medullaris"* of Bentham's Fl. Austr., VII (1878), 708-709, may include both *C. marcescens* and *C. cunninghamii*. He cited "Cape Otway, Marriner" but there are specimens of both the last mentioned species in the National Herbarium, Melbourne, collected by G. Marriner in the Cape Otway region. Specimens of *C. cunninghamii* mentioned by Bentham as *C. medullaris* include "Cape Otway, Wilkinson" (K.) and "near Circular Head, S. B. Emmett" (K.). On p. 709, l.c., Bentham cited a specimen of *C. medullaris* collected by W. Woolls on the Richmond River, N.S.W. Moore and Betche in their Handbook of the Flora of New South Wales (1893), 505, considered this locality to be a mistake. Unfortunately I have been unable to locate this specimen. It is not in the National Herbarium, Melbourne.

5. **Cyathea grevilleana** *Mart.*, Ic. Pl. Crypt., (1834), 78; M. Tindale in Amer. Fern Journ., XLI, 4 (1951), 97.

Habit arborescent, the caudex "10 to 12 ft. high, 12 inches in diameter." *Primary rhachises* fawn, the lower surface not muricate, the upper surface crispate-strigose with brown, dark-jointed hairs. *Secondary rhachises* fawn, the lower surface smooth, clothed above with brown, curved, dark-jointed hairs. *Fronds* 3-pinnate, membranous, dark green above, paler below. *Primary pinnae* with wingless petiolules, 38 to 62 cm. long. *Secondary pinnae* with short wingless petiolules, 18 to 25 pairs, 7 to 10 cm. long and 1.8 to 2.3 cm. broad, the lower 2 pairs slightly shorter, cultrate (5:1 or 4:1), the apex abruptly acuminate. *Tertiary segments* sessile except the first one or two pairs, 17 to 21 pairs, not joined at the base except the apical segments or the middle pairs cut to within 0.5 mm. of the costa, oblique, often subfalcate, widely spaced, 0.9 to 1.5 cm. long and 3 to 4 mm. broad, cultrate (6:1) to oblong (2:1), the margin slightly to deeply crenate-serrulate or lobed, the apex subacute or obtuse, the base scarcely dilated or even contracted in the stalked pairs. *Costae* pubescent above with brown strigose hairs, towards the base on the lower surface clothed with lanceolate to broadly ovate, often bullate, brown or red-brown scales which have red marginal spinules and red lignified cells towards the centre and apex, intermixed with very small, brown, dark brown or red-brown, strongly bullate scales with a terminal tuft of red spinules but towards the apex of the costae long, yellow, setaceous hairs become more numerous than the scales. *Costules* glabrous above, clothed sparsely on the lower surface with long, yellow, simple, setaceous hairs and small, yellow or brown, strongly bullate scales which are either long-acuminate or more usually terminate in a tuft of red spinules (Pl. XIII, fig. 1), together with more or less ovate, yellow scales with red marginal spinules. *Minor veinlets* free, bifurcating very close to the costules, 4 to 10 pairs, glabrous above and below, or with an occasional long, yellow, unbranched, setaceous hair on the lower surface. *Sori* indusiate, globular, 0.5 to 1 mm. in diam., 1 to 6 pairs, closer to the midrib than the margin, situated on the fork of the minor veinlets. *Indusium* complete, cup-shaped, persistent, rather dark brown, membranous but firm, opening towards the margin of the segment with a small rounded aperture which is later jagged. *Receptacle* globular, columnar or conical, black or grey, furfuraceous. *Paraphyses* few, long, narrow, consisting of a single row of cells. *Sporangia* cuneate, with a complete oblique annulus of about 24 thick-walled cells and 8 thin-walled cells, the pedicel short and thick. *Spores* tetrahedral, trilete, minutely papillose.

N.B.—The above description was compiled from the Mt. Lindsay material; no Jamaican specimens were used.

DISTRIBUTION: *Australia*: Mt. Lindsay (border of New South Wales and Queensland); *Jamaica.*

HOLOTYPE: Jamaica, Greville, 1832, Herbarium Martii (BR., seen).

SPECIMENS CITED: Mt. Lindsay, N.E. Australia, W. Hill, no date (NSW. P1970; K., 2 sheets); Mt. Lindsay, ravines, caudex 10 to 12 ft. high, 12 inches in circumference, W. Hill, 25.12.1858 (K.). These specimens constitute the HOLOTYPE of *Cyathea lindsayana.*

ABSOLUTE SYNONYM: *Disphenia grevilleana* Kunze in Linnaea, XXIII (1850), 252, based on *Cyathea grevilleana* Martius.

EQUIVALENT SYNONYM: *Cyathea lindsayana* Hook. in Hook. et Bak., Syn. Fil., ed. 1 (1865), 25; F. Muell., Fragm. Phyt. Austr., V (12.1866), 188, VIII (4.1874), 177; Benth., Fl. Austr., VII (1878), 708 (as *C. lindseyana*); Moore et Betche, Handb. Fl. N.S.W., (1893), 505; F. M. Bail., Queensl. Fl., (1902), 1947; C. Chr., Ind. Fil., (1905), 193.

In Hook. et Bak., Syn. Fil., ed. 1 (1865), 25, Sir William Hooker described a tree-fern, *Cyathea lindsayana*,* from material said to have been collected by Walter Hill at Mt. Lindsay which is on the border of Queensland and New South Wales. The three pinnae communicated by Hill are now located in the Kew Herbarium, except for a fragment sent to the National Herbarium, Sydney, in 1915. I have been unable to find any other record of this species in Australia. No further specimens from the latter country are in the British Museum of Natural History, South Kensington, nor in any of the other Australian herbaria. Although botanists have collected ferns on Mt. Lindsay quite recently, they have failed to locate this species again. Nevertheless, much of the dense rain forest on the slopes of the mountain must be incompletely explored botanically.

The type of *Cyathea lindsayana* matches perfectly the type of *C. grevilleana* Mart., i.e. Jamaica, Greville, 1832, Herb. Mart. (Jardin Botanique de l'État, Brussels), described in Icones Plantarum Cryptogamicarum (1834), 78. Hill's specimens have been compared also with other specimens from Jamaica, i.e. Orcutt No. 6078, Harris No. 7725, and with specimens recently collected by George R. Proctor (Nos. 3962, 4815, 4909, 5061). I suggest that specimens from Jamaica must have been mixed with those received from W. Hill, as it is unlikely that a fern from the West Indies would occur in Australia, unless cultivated. The latter would be most unlikely in 1858. Hill's correspondence to Sir William Hooker does not clarify the matter, as he only mentions that "he hopes to send a better account of the ferns found at Mt. Lindsay". This species must be known as *C. grevilleana*; whether or not the specimens were really collected on Mount Lindsay is a matter of conjecture.

The holotypes of *C. lindsayana* and *C. grevilleana* are both characterized by small, brown, fawn or yellowish, bullate costal scales surmounted by a tuft of several, dark red spinules and furfuraceous, brown scales with a terminal dark red spinule and a dark brown central band. Towards the apices of the pinnae there occur a number of stiff, yellow, unbranched hairs consisting of a single row of cells. The deeply cyathiform indusia opening by an apical pore, the columnar or conical, minutely grey-furfuraceous receptacle and the margin of the ultimate segments are similar in the two types.

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*See "Notes on Three Australasian Ferns" by M. Tindale in Amer. Fern Journ., XLI, 4 (1951), 97.

Deeply cupuliform indusia combined with the above types of scales and seta-like hairs do not occur in many species of *Cyathea* sens. lat. but are characteristic of a group of Central American tree-ferns. *Cyathea nigrescens* (Hook.) J. Sm. and *C. tenera* (J. Sm.) Moore are members of this group.

6. **Cyathea robertsiana** (*F. Muell.*) *Domin*, Pterid., (1929), 263; Domin in Acta Bot. Bohem., IX (1930), 154; D. A. Goy in Queensl. Nat., XII, 3 (1943), 44.

Habitat mountain rain forests and ravines. *Habit* arborescent, the caudex smooth with long narrow scars, 2 to 5 m. high, 5 to 10 cm. in diameter, elongated beyond the last frond, the fronds not forming a regular crown. *Stipes* not winged, 3- or 6- sulcate above, dark red-brown or brown, minutely scabrous, clothed on the lower surface with unbranched, whitish or yellowish hairs and on the upper surface with a few, scattered, obtuse, papery, broadly ovate (5:4) to oblate (6:9) scales which are brown and slightly lustrous towards the centre and with a pale brown, friable margin. *Primary and secondary rhachises* shallowly grooved above, light brown or light red-brown, finely muriculate, often very densely clothed especially on the upper surface with unbranched, prominently jointed, strigose, curved, hyaline or yellow hairs and a few papery, fawn scales. *Costae* narrowly winged throughout their length, (wing 0.3 to 0.5 mm. broad), clothed with light brown or yellow strigose hairs on the upper surface and below with more spreading, hyaline or yellowish, long, stiff, bulbous-based hairs of which the upper, often moniliform portion is composed of a single row of cells (P. XI, fig. 3); clothed on the lower surface with a few, scattered, entire, fawn, bullate or flat, thin, lanceolate to broadly ovate, mostly obtuse or broadly rounded, rarely acuminate scales which are darker towards the centre. *Fronds* 2-pinnate-pinnatifid with very deeply lobed tertiary segments, softly herbaceous, light green, the upper surface slightly darker than the lower, shortly and densely villous above with rather appressed, often bulbous-based hairs, villous below but the hairs more spreading and about twice as long as those on the upper surface; fronds about 1 to 3 m. long including the stipes. *Primary pinnae* stalked, only the upper petiolules winged, horizontal or erecto-patent, lanceolate-oblong (3:1), 15 to 60 cm. long, 6 to 20 cm. broad, the apex long-acuminate. *Secondary pinnae* with winged petiolules, usually 20 to 30 pairs, alternate, widely spaced, the lower pinnules usually horizontal and the upper pinnules erecto-patent, or erecto-patent throughout, oblong-lanceolate (4:1 or 3:1), 5 to 10 cm. long, 1.5 to 3 cm. broad, the apex abruptly acuminate. *Tertiary segments* with winged petiolules, mostly 14 to 20 pairs, cut almost to the costa which is very evenly winged by a band of tissue 1 to 1.5 mm. broad, alternate, widely spaced, straight or subfalcate, narrowly oblong (3:1), usually 6 to 18 mm. long and 2 to 6 mm. broad, the apex obtuse. *Ultimate segments* sessile, usually 5 to 11 pairs, cut almost to the costule, more or less oblong or rounded, deeply notched, usually bifid or trifid. *Minor veinlets* free, one pair per ultimate segment, forked in the lowest third of each lobule, both surfaces of the veinlets villous. *Sori* indusiate, orbicular, 0.3 to 1 mm. in diameter, 6 to 10 pairs, one sorus on each ultimate segment at the fork of the minor veinlet. *Indusium* incomplete, comprised of a fawn, membranous scale with an irregularly indented margin, subtending the sorus on the side closest to the midrib of the tertiary segments. *Receptacle* small, globular. *Paraphyses* numerous, long, hyaline, composed of a single row of cells except at the bulbous base which is multicellular; about twice as long as the sporangia. *Sporangia* obliquely pyriform, with a short, narrow pedicel; with a complete annulus of 13-16 thickened cells and a definite stomium of 6-12 large, thin-walled cells. *Spores* tetrahedral, trilete, yellow, knobbly, 21 to 30 μ x 26 to 34μ.

Distribution: North-eastern Queensland, in the mountain rain forests especially on Mt. Spurgeon and Bellenden-Ker.

HOLOTYPE: Rockingham's Bay, Dallachy, received at the Herbarium of the Royal Botanic Gardens, Kew, from F. Mueller in September 1865. This specimen must have been collected and despatched from Melbourne to Kew prior to the date of publication of this species, i.e. July 1865, owing to the length of time which it took to send specimens from Melbourne to England at that period. There are six collections of *C. robertsiana* made by Dallachy in the Rockingham Bay district and deposited in the National Herbarium, Melbourne, but all of them were collected after July 1865. ISOTYPE?: Rockingham's Bay, Dallachy, "tree-fern has splendid foliage, stem 6 ft. high, in the range" (MEL.). This specimen, like the holotype, is fragmentary. In Fragm. Phyt. Austr., V (1865), 54, Mueller mentioned that the caudex was 6 ft. tall.

SPECIMENS CITED: *Queensland*: Mt. Spurgeon, very slender tree-fern, C. T. White No. 10693, 9.1936 (BRI.); Molloy Brack, near Mt. Lewis Clearing, rain forest, H. Flecker, 30.1.1941 (CAIRNS 7251); Cairns district, M. J. Manski (CAIRNS); Bartle Frere, top camp (BRI.); top of Lamb Range, above Hambledon, A. Johnson, 21.11.1946 (CAIRNS 10590); Bellenden-Ker, at about 2000 ft. alt., C. T. White, 1.1923 (NSW. P744; BRI.); Bellenden-Ker Range, shady ravines, graceful slender tree-fern, stems 8 ft. high, 4 ins. diam., W. Hill, 6.1874 (K.); Bellenden-Ker, slender tree-fern ± 3.5 m., fronds 3 m. long, in small forest, 5200 ft. alt., L. S. Gibbs No. 6320, 1914 (K.; BM.); between Cairns and Herberton, C. J. Wild, 1891 (BRI.); Herberton, R. F. Waller, 1908 (NSW. P743); Johnstone River, Kefford (BRI.); Johnstone River (NSW. P742; BRI.); Rockingham Bay, Dallachy (BM.); between Cleveland Bay and Rockingham Bay, Hill, received 1.1866 (K.); Paluma Range, K. Kennedy, 1.8.1948 (NSW. P5572); Eungella Range, South Kennedy District, alt. ca. 3400 ft., a slender stemmed tree-fern about 8 ft. high (seen to 15 ft.), smooth but marked by long, narrow leaf-scars; uncoiled fronds densely covered with broad scales, few persisting on the leaf bases, L. S. Smith and L. J. Webb No. 4756, 26.10.1953 (BRI.).

ABSOLUTE SYNONYM: *Alsophila robertsiana* F. Muell., Fragm. Phyt. Austr., V (7.1865), 54 and V (2.1866), 117; Benth. Fl. Austr., VII (1878), 712; F. M. Bail., Syn. Queensl. Fl., Suppl. 3 (1890), 91; F. M. Bail., Lith. Ferns Queensl., (1892), t. 39; F. M. Bail., Queensl. Fl., VI (1902), 1949; C. Chr., Ind. Fil., (1905), 47; Domin in Bibl. Bot., LXXXV, 1 (1914?), 36.

This fern is unique amongst the Australian species of *Cyathea* in that the fronds are densely villous, although a few, ovate to very broadly ovate scales are present along the costae. The lower surface of the lamina of *C. robertsiana* is quite velvety to the touch. The fronds do not form a proper crown as in the other Australian species but are scattered along the caudex.

7. **Cyathea woollsiana** (*F. Muell.*) Domin, Pterid., (1929), 263, as *C. woolsiana*; D. A. Goy in Queensl. Nat., XII, 3 (1943), 42; M. D. Tindale in Rev. S. Am. Bot., VIII, 6 (1950), 175.

Habitat mountain rain forests. *Habit* arborescent; caudex slender, tuberculate, the leaf-scars clean, rather widely spaced.* *Stipes* not winged, deeply sulcate above, bright yellow-brown, dark red-brown at the base, lustrous, densely muricate with obtuse, dark brown tubercles 1-3 mm. long and sparsely clothed with fawn, appressed squamules which have long, fawn, filiform, marginal processes, clothed at the base with dark brown, thick, almost woody scales which are linear (12:1 or more), mostly 1.5 to 2.5 cm. long and 1 to 2 mm. broad, gradually tapering into a long, spine-like upper portion and covered with a rust-coloured powder at the base. *Primary and secondary rhachises* stramineous, bright yellow-brown or red-brown, lustrous, trisulcate above, smooth or slightly muricate below, the upper surface densely clothed with hyaline, yellow-brown, brown or dark red, crisped, unbranched hairs each consisting of a single row of cells with prominent joints between them, also frequently bearing a few, fawn, ovate or rounded scales with long, filiform, marginal processes and sometimes with dark red spinules, and clothed with a few, narrow, lanceolate, fawn scales; glabrescent on the lower surface. *Costae* brown, yellow-brown or red-brown, narrowly winged throughout their length, densely clothed above and very sparsely below with

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* After this paper had gone to press collections were seen of *C. woollsiana* made by P. R. Messmer at the source of the Walsh River, Q., in open *Eucalyptus-Casuarina* forest on sandy banks, almost in water (NSW. P6924) which showed persistent bases of the stipes on a trunk 5 ft. high and a collection by L. S. Smith at Paronella Park, Mena Creek, Q., on the 5th Aug. 1948 (BRI.) had the bases persistent in the upper 3 to 4 ft. on a trunk 8 to 10 ft. high. According to Watts (NSW. P1417) the leaf-scars are clean and widely spaced.

hairs similar to those on the rhachises (the hairs on the lower surface rather weak), also bearing on the lower surface fawn, rounded (6:5), orbicular (6:6) or broadly ovate (6:5) scales with irregular, fawn fimbriae and an elongated, filiform apex or a long, red, terminal spine and with a few similar spines on the margin and/or on the surface (Pl. XIII, fig. 3). *Fronds* 2-pinnate-pinnatifid or rarely 3-pinnate, dark green above, glaucous beneath, membranous or herbaceous. *Primary pinnae* petiolulate, the stalk not winged; lower pinnae horizontal, the upper erecto-patent, narrowly oblong (3:1) to oblong (2:1), 30 to 65 cm. long, 9 to 20 cm. broad, the apex shortly acuminate. *Secondary pinnae* petiolulate, almost sessile, usually 20 to 40 pairs, alternate or the lower pairs opposite, rather widely spaced, cultrate-narrowly lanceolate (6:1) to narrowly oblong-lanceolate (3:1), mostly 4.5 to 10 cm. long and 1 to 2.5 cm. broad, the apex abruptly acuminate. *Tertiary segments* sessile, joined at the base, except very rarely the lowest pair next to the secondary rhachis, mostly 14 to 25 pairs, cut to within 0.1 to 0.5 mm. of the costa, alternate, up to 2 mm. apart, subfalcate, cultrate (6:1) to oblong (2:1), 5 to 13 mm. long, 1.5 to 4 mm. broad, the apex obtuse or broadly rounded and often erose, the margin crenate-serrate for approximately three-quarters of its length. *Midribs* clothed with a few, rounded or ovate, laciniate scales on the lower surface and above with a few, unbranched, prominently jointed, yellow or hyaline hairs. *Minor veinlets* free, once forked except a few of the distal ones, glabrous, usually 6 to 10 pairs in each ultimate segment. *Sori* indusiate, orbicular, about 0.5 mm. broad, 1 to 4 pairs per ultimate segment, the upper sori very close to the midrib (about 0.2 mm.), situated on the fork of the minor veinlet or at a short distance along the upper branchlet; sori usually occurring in the lowest third of each ultimate segment. *Indusium* small, hemispherical, surrounding one-third to one-half of the sorus, firm, not splitting into long threads, dark or light brown, darker towards the centre, the margin erose or almost entire. *Receptacle* small, ovoid or globular, black, minutely grey-furfuraceous, with a fairly persistent, apical tuft of fawn, ovate or lanceolate scales. *Paraphyses* few, fawn, not prominent, shorter than or the same length as the sporangia, consisting of a single row of cells with red septae. *Sporangia* cuneate, rather elongated, with a complete, oblique annulus consisting of 16 to 18 thick-walled cells and 9 to 10 thin-walled cells including the stomium, the pedicel short and thick. *Spores* tetrahedral, trilete, smooth when immature, later papillose, 33 to 43μ x 41 to 45μ.

Distribution: Coastal ranges of north-eastern Queensland.

Holotype: Mt. Graham, Rockingham Bay area, North Queensland, growing in the gorge at the top of the mountain, J. Dallachy, 9.11.1868 (MEL., examined). At the Kew Herbarium there are two Syntypes collected by Dallachy at Rockingham Bay in 9.11.1868. They are labelled "*Alsophila woollsii* F.v.M." in Mueller's own handwriting.

Specimens Cited: *Queensland*: Cook district, Mt. Spurgeon, Root's Creek, large tree-fern, C. T. White No. 10600, 9.1936 (BRI.; K.); Trinity Bay, Fitzalan, 1882 (P.); Kuranda, Street's Gully, from a young plant, W. W. Watts, 7.1913 (NSW. P754, P1417 and P1418); Cairns, W. W. Froggatt, 1886-87 (NSW. P756 and P755); Stoney Creek, near Cairns, W. W. Watts, 7.1913 (NSW. P753); Cook district, between Cairns and Herberton, C. J. Wild, 1891 (NSW. P1296; BRI.); Herberton, R. F. Waller, 1908 (NSW. P752); Russell River, W. A. Sayer, 1887 (P.); Cardwell, North Kennedy district, ranges, A. J. Campbell, 6.1916 (BRI.); Rockingham Bay, Dallachy, circa 1868 (BRI.) and 9.11.1868 (K.); Mt. Graham, Rockingham Bay area, J. Dallachy, 2.8.1870 (MEL.).

Absolute Synonyms: *Alsophila woollsiana* F. Muell., Fragm. Phyt. Austr., VIII (1874), 179, *holotype* cited above; C. Chr., Ind. Fil., (1905), 49 (as *A. woolsiana*); *Alsophila leichhardtiana* F. Muell. var. *woollsiana* (F. Muell.) Domin in Bibl. Bot., LXXXV, 1 (1914?), 35; *Cyathea leichhardtiana* (F. Muell.) Copel. var. *woollsiana* (as *woolsiana*) (F. Muell.) Domin in Acta Bot. Bohem., IX (1930), 129.

In Vict. Nat., LXVI, 3 (1949), 59, N. A Wakefield again made the combination *Cyathea woollsiana* (F. Muell.). However, I consider that Domin had already published this combination effectively in his Pteridophyta (1929), 263.

Bentham in his Fl. Austr., VII (1878), 712, did not retain *Alsophila woollsiana* as a distinct species but stated that it only differed from *A. leichhardtiana* in the "dense woolly tomentum of the rhachis which is more or less observable in some other specimens". Domin reduced *A. woollsiana* to a variety of *A. leichhardtiana* despite their very superficial resemblance.

The principal distinctions between the two species are set forth below:—

Cyathea woollsiana	*Cyathea leichhardtiana*
1) Stipes bright yellow-brown above, dark red-brown at the base.	1) Stipes dark red or chocolate-coloured.
2) Scales of the bases of the stipes dark brown, thick, almost woody, with a spine-like upper portion.	2) Scales of the bases of the stipes pale stramineous to almost white, thin, silky, acuminate.
3) Scales of the lower surface of the costae fawn, mostly rounded or broadly ovate with long, irregular, fawn, filiform marginal processes and a few, dark red spinules.	3) Scales of the lower surface of the costae atropurpureous or yellow, narrowly lanceolate to broadly ovate with very numerous, atropurpureous, marginal spinules.
4) Indusium hemispherical, surrounding one third to a half of the sorus, firm, not splitting into long threads, dark or light brown, darker towards the centre, the margin erose or almost entire.	4) Indusium surrounding or partly surrounding the sorus, soon broken into silky, white or very pale fawn threads, the margin with fine white fimbriae or atropurpureous lacerations.

Cyathea woollsiana has rather a superficial resemblance to *C. cooperi*, although the clean-cut scars on the trunk are not as closely spaced as in the latter. However, the paleae are very different in these two species, the scales of the bases of the stipes being dark brown in *C. woollsiana* but smoky white and red-brown in *C. cooperi*. The scales of the costae are fawn and irregularly fimbriate in the former species but substellate and red or white in the latter. The basal tertiary segments of the lamina in *C. woollsiana* are rarely dissected to the costa, whereas in *C. cooperi* the fronds are almost always tripinnate.

8. **Cyathea marcescens** *N. A. Wakefield* in Vict. Nat., LIX, 2 (6.1942), 33; W. Hunter in Vict. Nat., LIX, 7 (11.1942), 118; N. A. Wakefield in Vict. Nat., LXII, 7 (11.1945), 126; M. Tindale in Rev. S. Am. Bot., VIII, 6 (1950), 175.

Habitat in mountain rain forests. *Habit* arborescent, the caudex 20 to 30 ft. (6 to 9.2 m.) high, 1 ft. (above 30 cm.) in diameter, clothed throughout its length with a dense skirt of dead, hanging fronds. *Stipes* black at the base, yellow-brown towards the apex, glossy, freely aculeate with black spines; basal scales bright brown, black towards the base, glossy, coriaceous, 3.5 to 5 cm. long and 2 to 5 mm. broad at the base, tapering into a very finely attenuated, hairlike, twisted apical portion terminating in one or two red spinules and bordered throughout their length by a very narrow, fawn, friable band with an irregular margin and usually with a few, red spinules. *Primary and secondary rhachises* sparsely tubercular, clothed above with a dense mass of very fine, curled, jointed, white, fawn or brown hairs together with a few, fawn, narrowly lanceolate or linear scales which often bear red spinules; clothed on the lower surface with fugacious, pale fawn, fimbriate, roundish squamules often bearing red spinules. *Costae* clothed above as on the secondary rhachises and below with fawn, silky, finely fimbriate, often more or less bullate, linear to oblate scales together with larger ovate or broadly ovate, bullate scales terminating in a red spinule, and also with very large, appressed, papery, fawn or brown scales with red spinules which usually occur near the margin (Pl. XI, fig. 4). *Fronds* 3-pinnate or sometimes the tertiary segments deeply lobed, herbaceous to subcoriaceous, dark green above, pale green below, up to 20 ft. (6 m.) long and up to 5 ft. (1.5 m.) wide.

Primary pinnae with short wingless stalks, narrowly oblong (3:1), 50 to 75 cm. long and 20 to 25 cm. broad, the apex shortly acuminate. *Secondary pinnae* very shortly stalked, almost sessile, 27 to 32 pairs, alternate, closely spaced and often overlapping, cultrate-narrowly lanceolate (6:1) to narrowly oblong-lanceolate (3:1), 9 to 11.5 cm. long and 2.3 to 3 cm. broad, the basal pinnae slightly shorter than the middle pinnae, the apex acuminate. *Tertiary segments*: lowest pair with a wingless petiolule, the lowest 3 or 4 pairs not connected at the base, the middle segments lightly joined, 17 to 23 pairs, falcate to straight, widely spaced (often 3 mm. apart at the base of the secondary pinna), cultrate (6:1) to narrowly oblong (3:1), 10 to 18 mm. long and 2.5 to 3 mm. broad, the apex subacute or sometimes acute, the margin lobed for three-quarters of the length of the segment, or lobed at the base and crenulate-serrate towards the apex, the base cordate or dilated. *Minor veinlets* transverse, once or twice forked, up to 12 pairs on a segment. *Sori* indusiate, orbicular, about 0.5 to 0.8 mm. in diam., 6 to 9 pairs on each ultimate segment, medial or sub-costular, situated on the fork of the minor veinlets or, when the veinlet is branched twice, on the upper fork. *Indusium* incomplete, comprised of a membranous, fawn or brown, hemispherical scale with an irregularly indented or sometimes fimbriate margin which occasionally bears a red spinule; base of indusium red-brown, subtending the sorus on the side nearest the costule. *Receptacle* oval, dark, stalked, elevated, bearing an apical tuft of entire, fawn or red-brown, persistent scales which are several cells wide. *Paraphyses* consisting of a single row of cells with red septae, shorter than or about the same length as the sporangia. *Sporangia* with a complete, oblique annulus of 16 to 20 thick-walled cells and 8 to 10 thin-walled cells, the pedicel short and thick. *Spores* tetrahedral, trilete, smooth when immature, later papillose, 33 to $45\mu \times 38$ to 51μ.

Distribution: This rare Australian species has only been recorded from Victoria at Combienbar, Mt. Drummer, Ford River, Mait's Rest (near the Parker River) and at Apollo Bay (in the Cape Otway Ranges).

Lectotype: Mt. Drummer, Victoria, about 8 plants along the creek below Drummer Spring, N. A. Wakefield No. 96, 2.2.1941 (MEL., examined).

Specimens Cited: *Victoria*: Mt. Drummer (below the Spring), East Gippsland, N. A. Wakefield, 3.1941 (MEL.); Mt. Drummer, N. A. Wakefield, 1.3.1941 (NSW. P1391); Mt. Drummer, fronds up to 18 ft. long and 5 ft. wide, associated with *Cyathea australis*, *C. leichhardtiana* and *C. cunninghamii* as well as *Dicksonia antarctica*, N. A. Wakefield, 11.10.1947 (NSW. P239); Ford River, west of Anderson's property, S. Otway region, O. P. Singleton, mid March 1946 (MEL.); near Apollo Bay, Cape Otway Ranges, (trunk), 9 ft. high, diam. 9 ins., fronds 14-17 ft. long, G. H. Marriner, 4.1880 (MEL.); Cape Otway, ex Herb. F. Mueller, 7.1877 (K.), 2 sheets.

Cyathea marcescens appeared under the name of *C. medullaris* in Ewart's "Flora of Victoria" (1930), 34, and in Ewart's "Handbook of Forest Trees for Victorian Foresters" (1925), 38. It may also be included under *Cyathea medullaris* Benth., non (Forst. f.) Sw., in the Fl. Austr., VII (1878), 708-709. Bentham cited material of *C. medullaris* which was collected by Marriner at Cape Otway, Victoria, but the latter obtained specimens of both *C. cunninghamii* and *C. marcescens* in this locality. These are preserved in the National Herbarium, Melbourne and were examined by the writer.

C. marcescens has a superficial resemblance to *C. cunninghamii* which occurs in the same localities in Victoria but is also found in Tasmania and New Zealand. These two species may be readily distinguished by the presence of small, fugacious, fawn, yellow or hyaline, stellate hairs and scales amongst the scales on the lower surface of the costae and costules in *C. cunninghamii*. The paleae on the bases of the stipes are different in these two species. They are bright brown (black at the base), coriaceous and with a very narrow fawn border in *C. marcescens*, whereas in the other species they vary from being thin and fawn to thick and dark brown.

C. australis is closely related to *C. marcescens,* as both species have tripinnate fronds of a similar type and both have bright brown, glossy, coriaceous scales at the bases of the stipes. In both species the greater portion of the caudex is covered with the persistent, broken bases of the stipes. However, there are minor differences in the paleae of the costae in the two species, also *C. marcescens* has a prominent hemitelioid indusium, whereas in *C. australis* a semicircular series of fawn, fimbriate scales surrounds three-quarters of, or, more rarely, the whole sorus.

9. **Cyathea australis** (*R. Br.*) *Domin,* Pterid., (1929), 262: D. A. Goy in Queensl. Nat., XII, 3 (1943), 42.

Habitat in rain forest gullies and on mountain slopes, in *Eucalyptus* and *Nothofagus* forests, on hillsides in moist shady situations or sometimes in long-cleared paddocks. *Habit* arborescent; caudex 2.5 to 20 m. high, 16 cm. to 1 m. in diameter, often swollen near the base, covered in the upper portion or almost to the base with the short, persistent, muricate bases of the stipes and densely matted with adventitious roots. *Stipes* (Pl. XV) not winged, trisulcate above, 1 to 3 cm. broad at the base, grey-brown, yellow-brown or light brown, dark brown towards the base, densely muricate with coarsely pointed, conical tubercles mostly 1 to 3 mm. long and mostly 0.5 to 1.5 mm. broad at the middle, densely clothed especially towards the base with scales and squamules; scales bright brown, glossy, coriaceous, linear (more than 12:1) to narrowly lanceolate (6:1), entire or slightly irregular (due to the flaking off of cells), mostly 2 to 5 cm. long and 0.5 to 6 mm. broad, very narrowly bordered throughout their length by a yellowish, friable wing and gradually tapering into a long, twisted, fibrillose apex terminated by 1 or several red spinules; squamules brown, slightly denticulate, obtuse or acute, broadly ovate, rounded or oblate. *Primary and secondary rhachises* brown above, yellow-brown, light brown or yellowish-white on the lower surface, trisulcate, towards the base densely scabrous with coarsely pointed, brown tubercles, more rounded tubercles occurring on the secondary rhachises and upper portion of the primary rhachis; almost glabrous on both surfaces or clothed above with a tomentum of fine, thread-like, curled, white or yellow, woolly hairs with swollen septae and on the lower surface with fawn squamules. *Costae* clothed with the same type of hairs as on the primary and secondary rhachises, often glabrescent, clothed below with fawn, bullate, more or less ovate scales with long, thread-like apices and slightly denticulate or fimbriate margins (Pl. XII, fig. 3), together with thread-like, linear scales, a few short hairs and occasionally a few, large, appressed, reddish-fawn scales with long, fibrillose apices and a few, red, marginal spinules. *Fronds* tripinnate or rarely 3-pinnate-pinnatifid, usually thinly coriaceous, rarely submembranous, dark green above, pale green or glaucous (sometimes almost white) on the lower surface, usually 2 to 4 m. long. *Primary pinnae* with often elongated petiolules, narrowly oblong-lanceolate (3:1) to oblong-narrowly ovate (2:1), usually 22 to 50 cm. in length, 12 to 26 cm. in breadth (mostly 14 to 18 cm. broad), the apex abruptly acuminate, the lower 2 pairs reduced in size. *Secondary pinnae* stalked, with petiolules which are not winged except towards the apex of the primary pinnae, 19 to 35 pairs, cultrate-narrowly lanceolate (6:1) to narrowly oblong-lanceolate (3:1), 4.2 to 13.2 cm. long and 1 to 3 cm. broad, the lower secondary pinnae usually horizontal or deflexed and slightly shorter than those at the middle, the upper secondary pinnae erecto-patent, sometimes dilated near the acuminate apex. *Tertiary segments* sessile or the lowest pair very shortly stalked, 14 to 24 pairs, falcate, lightly joined at the base, the lowest 1 to 4 pairs occasionally free, cultrate (6:1) to oblong (2:1), usually 0.4 to 1.3 cm. long and 0.2 to 0.4 cm. broad, the margin revolute, crenulate or serrulate, sometimes with rounded lobes near the base of the segments, the apex acute or subacute. *Minor veinlets* free, forked half-way between the margin and midrib and frequently again forked near the midrib, unbranched in young fronds, clothed with short, unbranched, septate, bicolorous (red and white) hairs. *Sori* exindusiate or sometimes with several fawn scales subtending the sorus, orbicular, about 0.5 to 1 mm. in diameter, 3 to 8 pairs per ultimate segment, medial or close to the midrib of the segment, situated on the fork of the minor veinlet (or, if the veinlet is forked twice, located on the upper bifurcation), usually surrounded by fibrillose hairs. *"Indusium"* a semicircular series of fawn, fimbriate, very thin scales subtending about three-quarters of, or, more rarely, the whole sorus. *Receptacle* ovoid, dark, often minutely grey-furfuraceous, sometimes bearing an apical, caducous tuft of scales which are several cells wide. *Paraphyses* numerous, consisting of a single row of cells with red septae, often swollen towards the apex, shorter than the sporangia. *Sporangia* with a complete, oblique annulus consisting of 16 to 18 cells with thick, orange or orange-red cells and 8 to 11 thin-walled cells including the stomium, the pedicel short and thick. *Spores* tetrahedral, trilete, smooth when immature, later papillose, 37 to 47μ x 43 to 53μ.

Distribution: South-eastern Queensland, New South Wales, Victoria and Tasmania in the coastal districts and ranges. This is perhaps the commonest Australian tree-fern. It is plentiful in the rain forests of the dividing ranges and Blue Mountains of New South Wales, especially at Mt. Wilson where there are very fine stands of this species on the cleared hillsides. It also occurs in gullies quite near the sea.

Lectotype: King's Island, Bass Strait, R. Brown No. 94, 1802, labelled by R. Brown (BM.), seen. Frond is not glaucous on the lower surface. This specimen was chosen out of the two syntypes because this was the first collection of his new species by R. Brown and also because he labelled the other syntype *Alsophila australis* β.

Isotypes: King's Island, R. Brown No. 94, Iter Australiense, 1802-05 (K.); King's Island, Bass Strait, R. Brown, 1802 (P.) and probably King's Sound, R. Brown, 1802-05 (NSW. P1536), (all examined).

Syntype: Port Jackson, R. Brown No. 95, 1802-05 (BM., seen), frond rather glaucous on the lower surface. There is a duplicate of this specimen at the Kew Herbarium.

In his Prodr. Fl. N. Holl. (1810), 158, Robert Brown cited the distribution of this species as Van Diemen's Land and the Port Jackson-Hunter River-Coal River district of the region now known as New South Wales.

Specimens Cited: *New South Wales*: Mt. Lindsay, Tweed River, all round the foot of the bluff, W. Forsyth, 9.1900 (NSW. P695); Mt. Lindsay, at the base of rocks, caudex 12 ft. high, 3 ft. in circumference, clothed with the bases of the old stalks of the fronds and crowned with a horizontal tuft of glaucous-green foliage, the fronds particularly thick and spiny, W. Hill No. 1 (MEL.); Mt. Lindsay, 3,500 ft. alt., J. L. Boorman, 3.1916 (NSW. P1457); Mt. Lindsay, tall plants 3 to 8 ft high, growing to about 4,000 ft. altitude, less hispid than usual in *C. australis*, lower surface generally of a silvery hue, rare, J. L. Boorman, 3.1916 (NSW. P1480); Mt. Lindsay, C. T. White, 10.1921 (NSW. P1546 and P1498; BRI.); Mt. Lindsay, alt. about 4,000 ft., tree-fern common in light rain forest on the upper slopes, stipes prickly at the base, rhachis rough for most of its length, S. L. Everist No. 1111, 2.6.1935 (BRI.); Macpherson Range, border of Queensland and New South Wales, C. T. White, 12.1918 (NSW. P1389); Macpherson Range, very glaucous fronds, C. T. White, 2.1912 (BRI.); Macpherson Range, alt. 3,500 ft., very glaucous fronds, C. T. White, 12.1918 (BRI.); Macpherson Range, stem fairly smooth, fronds drooping, C. T. White, 6.1914 (BRI.); north-east boundary of N.S.W., F. Mueller (MEL.); Mt. Warning, very common in rain forest, C. T. White and L. J. Brass No. 12051, 1.1.1938 (BRI., GH.); Three Mile Scrub, Byron Bay. W. Forsyth, 11.1898 (NSW. P1507); Byron Bay, W. Forsyth, 11.1899 (NSW. P6186); New England, C. Stuart No. 178 "*Alsophila* of a very different habit to *A. australis* the caudex being much more slender and taller (22 ft.), the pinnules also more acute, fronds 5 to 6 ft. long" (MEL.); Goffs Gully, New England, C. Stuart No. 438 (MEL.); Demon Creek, New England, C. Stuart No. 408 (MEL.); Tenterfield, C. Stuart, 8.7.1874 (MEL.); Dunoon, Richmond River, R. Helms, 4.1890 (NSW. P768); Alstonville Cutting, 7 miles from Ballina, W. W. Watts, 5 or 6.1902 (NSW. P1449); Richmond River, W. W. Watts (NSW. P1448); Clarence River, McLennan's, F. Mueller's Herb. (MEL.); Mt. Lindsay, Nandewar Mountains, R. H. Cambage No. 2425, 5.11.1909 (NSW. P769); Coffs Harbour, on a hill near the sea, L. A. S. Johnson, 9.1947 (NSW. P5174); Dorrigo, W. Heron, 6.1910 (NSW. P1548); Macleay River, H. Beckler (MEL.); Warrumbungle Ranges, W. Forsyth, 10.1899 (NSW. P1550); Mt. Maiden, Seaview Range, Hastings River, J. H. Maiden, 11.1897 (NSW. P1491); near Wallis' Saw Mill, Bulga, Manning River, W. W. Watts, 4.1915 (NSW. P1520 and P1511); Bulgong Heights, W. W. Watts, 5.1916 (NSW. P1369); Dyer's Crossing, via Taree, L. Gilbert, 28.8.1946 (NSW. P646); Copeland, via Gloucester, young tree-fern, trunk 1 ft. high, 10 fronds, persistent stipe bases, L. Gilbert, 26.10.1946 (NSW. P738); Barrington Tops (i.e., Upper William's River district), E. Cheel, 22.9.1930 (NSW. P1547); Pittwater, Sydney district, L. Stephenson (NSW. P1504); Hornsby district, H. Deane (NSW. P757); "Sylvan Glades", Kurrajong, L. Atkinson (NSW. P1503); Wheeney Creek, L. Atkinson (MEL.); Bents Basin (Nepean River) (MEL.); Parramatta, Batus junior (MEL.); Lawson, W. W. Watts, 4.1905 (NSW. P1460); Porter's Pass, Blackheath, in rain forest, on bank quarter mile from creek, trunk 10 to 12 ft. high, E. F. Constable, 27.12.1946 (NSW. P814); Blackheath, alt. 1,048 m., in cleared gully, E. F. Constable, 3.1953 (NSW. P6326; U. SING.); Bowen's Creek, Bilpin to Mt. Irvine Rd., Blue Mts., tree-fern 3 m. high, on rain forest hillside, basalt, M. Tindale and E. F. Constable, 26.3.1952 (NSW. P2872; UC.; MO.); Mt. Victoria, W. W. Watts, 8.1914 (NSW. P1370); Mt. Colong, tree-fern 4 ft. high, side of sandstone ridge, E. F. Constable, 4.3.1948 (NSW. P5884; K.); Yerranderie-Mt. Werong, R. H. Cambage No. 2263, 4.10.1909 (NSW. P1505); Waterfall, J. H. Camfield, 25.12.1895 (NSW. P1515) and 2.1.1897 (NSW. P1179); Audley, National Park, in rain forest gully, trunk 6 ft. high, M. Tindale, 27.10.1946 (NSW. P681); Stanwell Park, on edge of rain forest, hilly country, E. F. Constable, 18.12.1946 (NSW. P6164); Bulli, S. Johnson, 1875 (MEL.); Bulli, L. Stephenson, very thin fronds (NSW. P1506); Mt. Keira, Wollongong, K. R., 1859 (NSW. P1502); Glow Worm Glen, Bundanoon, rain forest, near waterfall, M. Tindale, 14.6.1944 (NSW. P199, P319 and P320); Badgery's Crossing to Nowra, W. Forsyth and A. A. Hamilton, 9.1899 (NSW. P1510); Shoalhaven (River), W. Bauerlen, 7.1888, No. 143 of R. Bonaparte (MEL.); Milton, fronds 4 to 5 ft. high, R. H. Cambage No. 2145, 23.12.1908 (NSW. P1549); Mt. Dromedary (near Narooma), Reader, 1880, No. 147 of R. Bonaparte (MEL.); Bermagui, W. Dunn, 12.1916 (NSW. P1543); Grey's Flat, Pambula, E. Cheel, c.1917 (NSW. P1516); Twofold Bay, L. Morton (MEL.).

Victoria: Mt. Drummer, N. A. Wakefield, 10.9.1939 (MEL.); Gippsland, F.M.C. (BRI.); Alberton, A. Newton No. 48, 1876 (MEL.); Black Spur, H. Deane, 1.1900 (NSW. P1512); Warburton, W. W. Watts, 1.1919 (NSW. P1519); Dandenong Ranges, E. of Melbourne, trunk rather thick, about 5 ft. high, L. S. Smith M48, 23.4.1943 (BRI.); Dandenong (Ranges), C. Walter (MEL.); Montrose, western foothills of the Dandenong Ranges, P. R. St. John, 18.7.1903 (MEL.); moist shady declivities of Mt. Disappointment (near Whittlesea), collector not stated, 10.1852 (MEL.); Erskine River, Lorne, W. W. Watts, 11.1919 (NSW. P1500); Aire River, near Cape Otway, C. Walter, No. 149 of R. Bonaparte (MEL.); Creswick, in mine shafts, rarely above ground, J. H. Willis, 5.1932 (MEL.); near Ballarat, G. Day, 1875 (MEL.); Mt. William, Grampians, in gully, tallest about 12 ft. high, D. Sullivan No. 31 (MEL.); Surrey River, near Gorac, Portland district, S.W. Victoria, in a gorge (tree-fern), 7 ft. high, fronds 9 ft. long, C. Beauglehole, 13.9.1942 (MEL.).

Tasmania: Near York Town(e), C. Stuart, 10.1849 (MEL.); about 12 miles from Launceston, C. Stuart (MEL.); Mt. Cameron, 6 ft. high, trunk 2 ft. high, leaves 5 to 6 ft. long, one plant amongst bracken on moist gravelly slope, H. D. Gordon, 29.8.1943 (HO.); Gould's Country, Upper George's River, near the Blue Tier, N.E. Tas., Spicer No. 78 (MEL.); George Bay (near St. Helens), L. Rodway (HO. 1065); west coast of Tasmania, Mt. Zeehan, T. B. Moore, 1893 (No. 146 of R. Bonaparte) (MEL.); garden, 327 Davey St. (Hobart), originally from Collin's Vale (near Glenorchy), J. Somerville, 7.8.1940 (HO.); Longley, L. Rodway (HO. 1065); Tasman Peninsula, L. Rodway, 4.1916 (HO. 1066 and HO. 1269); tramline, Adventure Bay, towards Cape Conella, J. Somerville, 23.1.1943 (HO.); Adventure Bay, Bruni Island, 10 ft. high, in shady gullies, 3,000 ft. alt., A. M. Olsen, 28.7.1939 (HO.).

Queensland: Blackdown Tableland, H. G. Simmons, 9.1937 (BRI.; BM.); Toowoomba, Q.L., C. H. Hartmann, 1874 (MEL.); top of Mt. Mitchell (near Wyreema), Main Range, alt. 3760 ft., in small stunted rain forest, C. T. White No. 6882, 19.7.1930 (BRI.; GH.); head of Dalrymple Creek, (near Cunningham's Gap, S.E. Queensland), C. H. Hartmann No. 517, 1875 (MEL.); Tambourine Mountain, J. Shirley, 12.1915 (NSW. P1537), very few sori on each ultimate segment; Tambourine Mountain, trunk clothed with the broken bases of frond stems, J. Shirley, 12.1915 (NSW. P1509); Upper Tallebudgera (Creek), C. T. White, 12.1917 (NSW. P1535; BRI.), there are more silky, linear scales than usual on the pinnules; Springbrook, alt. about 2,000 ft., tree-fern on roadside in narrow strip of rain forest, D. A. Goy and L. S. Smith No. 187, 30.1.1938 (BRI.; BM.); Springbrook, alt. 2,000 ft., tree-fern in cleared country, near Canyon Wall, caudex about 8 ft. high, D. A. Goy and L. S. Smith No. 228, 31.1.1938 (K.; BRI.); Lamington National Park, Moreton District, in antarctic beech forest (*Nothofagus*, etc.), tree-fern up to 30 ft. high, trunk columnar covered with short rough, decurrent leaf-bases; leaves several but usually not very numerous, sub-horizontal, up to 12 ft. long; stipes ca. 1 to $1\frac{1}{2}$ ft. (long), not very prickly, blade green above, glaucous beneath, lower pinnae not much shorter and not very distant, ramentum not very dense. S. T. Blake No. 13025, 25.5.1937 (BRI.; K.); near Binna Burra, Lamington National Park, dominant in lower story of *Eucalyptus-Casuarina* forest on hillside, not very slender tree-fern of 6-12 ft. with rather flattened crown, leaf-bases persistent at top for a short distance, deciduous below; leaves green above, paler below, rhachis and stipe more or less prickly, S. T. Blake No. 14646, 3.10.1942 (BRI.); Spring Creek Plateau, S.E. Queensland, (near

Killarney), very common in rain forest around Spring Creek, alt. about 3,100 ft., D. A. Goy and L. S. Smith No. 346, 1.5.1938 (BRI.); Mt. Ballow, alt. 3,500 ft., in *Nothofagus* forest associated with and apparently as common as the normal form, C. T. White No. 11114, 26.7.1937 (BRI.; K.), this specimen is very glaucous; Mt. Ballow, alt. 3500 ft., tree-fern in *Nothofagus* forest, C. T. White No. 11110, 25.7.1937 (BRI.), not very glaucous.

Absolute Synonym: *Alsophila australis* R. Br., Prodr. Fl. N. Holl., (1810), 158; Lowe, Ferns Br. and Exot., VIII (1872), t. 63; Hook. et Bak., Syn. Fil., ed. 2 (1874), 40; Benth., Fl. Austr., VII (1878), 710; F. M. Bail., Syn. Queensl. Fl., (1883), 689; F. M. Bail., Lith. Ferns Queensl., (1892), t. 34; Moore et Betche, Handb. Fl. N.S.W., (1893), 506; F. M. Bail., Queensl. Fl., VI (1902), 1949; Rodway, Tasm. Fl., (1903), 289; C. Chr., Ind. Fil., (1905), 40; Domin in Bibl. Bot., LXXXV (1914?), 30, excluding varieties; Maiden et Betche, Census N.S.W. Pl., (1916), 1; Ewart, Fl. Vict., (1930), 35; Melvaine, Check List N.S.W. Pter., Proc. Linn. Soc. N.S.W., LXI, 3-4 (1936), 114.

Equivalent Synonyms: *Alsophila loddigesii* Kze. in Linnaea, XX (1847), 7; in Linnaea, XXIII (1850), 221; Hook. et. Bak., Syn. Fil., (1874), 458; Benth., Fl. Austr., VII (1878), 710; F. M. Bail., Syn. Queensl. Fl., (1883), 689 (as *A. loddigessii* Kze.); Moore et Betche, Handb. Fl. N.S.W., (1893), 506; F. M. Bail., Queensl. Fl., VI (1902), 1948; C. Chr., Ind. Fil., (1905), 44; Domin in Bibl. Bot., LXXXV (1914?), 30; Melvaine, Check List N.S.W. Pter., Proc. Linn. Soc. N.S.W., LXI, 3-4 (1936), 115; *Alsophila australis* R. Br. var. *glauca* F. M. Bail. in Queensl. Agr. Journ., XXVIII (1912), 203; *Cyathea australis* (R. Br.) Domin var. *glauca* (F. M. Bail.) Domin in Acta Bot. Bohem., IX (1930), 96, based on the preceding variety; *Cyathea loddigesii* Domin, Pterid., (1929), 262, based on *Alsophila loddigesii* Kze.

In the Amer. Fern Journ., XLI, 4 (1951), 98, I chose a lectotype for *Alsophila loddigesii* Kze., namely "Lodd. H. bot. Lips. 44, sententiam tuam expeto" (K., seen), labelled by Kunze himself. Kunze's types in the Botanical Institute of the University of Leipzig are supposed to have been destroyed according to A. H. G. Alston in his "Report of the State of Taxonomic Botany and Botanical Collections in some areas of Germany since 1939". In the Muséum National d'Histoire Naturelle, Paris, there is another specimen of *A. loddigesii* labelled "H. Lips. 51 N. Holl., ex Museo Botanico Berolinensi, *Alsophila loddigesii*" also determined by Kunze. At the British Museum of Natural History there is a photograph of another possible isotype from the Brussels Herbarium. This specimen is labelled "Hort. Lips. ex Mus. Bot. Berol.".

By a comparison of the lectotype of *Alsophila loddigesii* Kze. with the type collection of *Cyathea australis*, it is evident that the two are conspecific. Both lectotypes are characterized by fawn or light brown, bullate, costal scales (which often have long, fibrillose apices), as well as by numerous, unbranched, reddish paraphyses each composed of a single row of cells. Other points of similarity are the woolly hairs on the upper surface of the secondary rhachises, the hemispherical indusia composed of a series of fawn, fimbriate scales, and the light stramineous lower surface of the rhachises. It is true that the ultimate segments are rather broad at the base in the pinnae of *A. loddigesii* but this is sometimes the case in *C. australis* e.g. NSW. P1415, Jerseyville, Macleay River, J. L. Boorman, 6.1910.

Bailey did not cite any type or specimens for *A. australis* var. *glauca* but he stated the distribution to be "at high altitudes, Macpherson Range". A specimen with very glaucous fronds was collected by C. T. White in the Macpherson Range in February, 1912 (BRI.). Bailey may have based his new variety on this specimen. I have not retained this variety as there is every gradation between green and glaucous fronds although the forms from Mt. Lindsay in the Macpherson Range are almost white on the lower surface. On the whole the more glaucous specimens occur in southern Queensland and northern New South Wales but the following material is also very glaucous: Illawarra (southern N.S.W.), Shepherd (MEL.); Surrey River, near Gorae, S.W. Victoria, C. Beauglehole, 15.9.1942 (MEL.); Gould's Country, Tas., Spicer (MEL.). The forms with more or less glaucous fronds are scattered throughout the range of the ordinary green form. In New South Wales the more glaucous forms occur both on the tablelands and in the coastal region.

In the Queensland Herbarium, Brisbane, there are two specimens of *Cyathea australis* which have deeply lobed tertiary segments namely: (1) Bunya Mountains, R.A.O.N. Excursion, C. T. White, 10.1919 (BRI.); (2) Moreton District, Mistake Plateau, alt. 3000 ft., D. A. Goy and L. S. Smith No. 477, 12.6.1938, tree-fern in rain-forest; trunk short for the size of the crown, rather thick; fronds very large, spreading; sori larger and more distant than is usual in *C. australis;* ultimate segments rather deeply incised.

The fronds of the latter specimen are very glaucous on the lower surface but in the material collected by C. T. White they are non-glaucous.

The scales on the lower surface of the costae and costules of Smith and Goy No. 477 are very dense but are much more fibrillose than those on the specimen from Bunya Mountains. The paleae of the former are very variable. Some of these scales could be described as follows: small, whitish, bullate scales with or without long fibrillose apices; narrow linear thread-like scales; large, flattened, more or less rounded scales with marginal red-brown spinules; large, whitish, ovate scales with slightly fimbriate margins and a terminal red spinule.

On the upper surface of the costae in Smith and Goy No. 477 there is a dense tomentum of woolly hairs which are so typical of *C. australis.* Unfortunately the hairs were caducous in the material from the Bunya Mountains.

In both specimens the sori are surrounded by brownish scales. Fibrillose paraphyses are plentiful on the soral receptacle in the specimen from Mistake Plateau. However, I would not consider that either of these two specimens is sufficiently distinct from *C. australis* to warrant its being described as a new species.

Superficially the fronds of *C. australis* are very similar to those of *C. cooperi,* from which they are readily distinguished under a lens or microscope by the substellate scales on the costae of the latter species. The scales on the bases of the stipes in *C. cooperi* are of two types, the larger being smoky white and the smaller dark red, whereas they are all bright brown in *C. australis.* The old broken bases of the stipes persist on the upper half of, or almost to the base of the trunk in the latter species,* but in *C. cooperi* the trunk is smooth and marked with oval or rounded, spirally arranged scars for the whole length. The double row of scar-like pneumatodes (ventilating areas) occurring on the stipes and main rhachises of *C. australis* and *C. cooperi* differ considerably in the two species. In *C. australis* they are 2 to 14 mm. long, dark and oblong or linear, whereas in *C. cooperi* they are whitish, linear and 0.5 to 3 cm. long. Near the base of the stipe the primary pinnae are only about 5 cm. long in *C. australis,* the lowest 2 to 4 pairs of primary pinnae being much reduced in size, whereas in *C. cooperi* the lowest pair is very slightly reduced and the basal 30 cm. or so of the stipe is devoid of pinnae.

10. Cyathea leichhardtiana (*F. Muell.*) *Copel.* in Phil. Journ. Sci. Bot., VI (1911), 360; Domin in Acta Bot. Bohem., IX (1930), 129.

Habitat in rain forests or *Nothofagus* forests, on mountain slopes or near creeks. *Habit* arborescent, taller in the higher situations; caudex very slender, about 5 to 10 cm. in diam., 1 to 7 m. high, covered with the decurrent prickly bases of the stipes or having a few smooth, widely spaced leaf-scars on the lower portion of the trunk. *Stipes* (Pl. XIV) not winged, deeply sulcate above, atropurpureous, dark red or chocolate-coloured, lustrous when the squamules are removed, freely aculeate especially on the lower surface, the spines black or dark red-brown, 1 to 4 mm. long,

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* See Domin in Bibl. Bot., LXXXV (1914?), 32, fig. 5 (as *Alsophila australis* R. Br.).

straight or curved, pungent-pointed (but the apex is readily broken off); both surfaces of the stipes clothed with tawny, appressed squamules intermixed with, or attached to, minute, atropurpureous, lanceolate (3:1) to broadly ovate (6:5) scales with markedly spicular margins; clothed at the base with a dense tuft of pale stramineous to almost white, silky, thin, subtortuous, linear (more than 12:1) scales 0.5 to 6 cm. long and 0.5 to 1 mm. broad, the apex and short marginal spinules of these scales brownish-red or atropurpureous. *Primary and secondary rhachises* bisulcate above, medium brown or pale yellowish-green above, atropurpureous, chestnut or red-brown below, aculeate on the lower surface with straight or curved spines up to 1 mm. long; upper surface strigose-crispate with brown or yellowish-fawn, uniseriate, simple, jointed, linear hairs in the grooves, towards the margins of the upper surface and on the lower surface clothed with fawn or grey, silky, fimbriate, irregularly-shaped, fugacious squamules together with a few narrowly lanceolate to ovate, atropurpureous or sometimes yellow scales or squamules with purplish marginal spinules. *Costae* medium brown or fawn and scabrous on the lower surface, very densely clothed above as on the rhachises, together with few to many spicular, atropurpureous or sometimes yellow scales, the lower surface with similar scales as well as tawny squamules. *Fronds* 3-pinnate or rarely 3-pinnate-pinnatifid, subcoriaceous to coriaceous, very dark green above and light green below. *Primary pinnae* with wingless petiolules, horizontal, oblong-lanceolate (3:1), 20 to 65 cm. long and 7 to 21 cm. broad, the apex long-acuminate or sometimes shortly acuminate. *Secondary pinnae* petiolulate, not winged except a few of those near the apex, usually 20 to 40 pairs, opposite, widely spaced, cultrate-lanceolate (6:1) to narrowly oblong-lanceolate (3:1), 3 to 13 cm. long and 1 to 3 cm. broad, the apex abruptly long-acuminate. *Tertiary segments* sessile or a few of the lower stalked in large specimens, the upper segments lightly joined at the base, mostly 12 to 26 pairs, the lowest 3 to 12 pairs free, alternate, 0.3 to 2 mm. apart, subfalcate to falcate, cultrate (6:1) to oblong (2:1), 2 to 20 mm. in length, 1.5 to 5 mm. in breadth (but mostly 2 mm. broad), the apex acute or mucronate and erose, the margin sharply denticulate or crenate-serrate for three-quarters to the whole length or lobed in large specimens (e.g. NSW. P1371, BRI. 12809 of C. T. White, and Howe Range, N. A. Wakefield (MEL.)), the base cordate or hastate. *Costules and minor veinlets* (as well as the laminae of the ultimate segments) clothed with few to many, broad, spicular, mostly yellowish to white scales with atropurpureous marginal spinules (Pl. XIII, fig. 2). *Minor veinlets* free, simple, once or rarely twice forked, usually 4 to 14 pairs, embedded in the upper surface. *Sori* orbicular, 0.3 to 0.8 mm. in diameter, 2 to 12 pairs on each ultimate segment, confluent in the later stages, very close to the midrib, i.e. about 0.5 to 1 mm. from the latter, situated on the fork of the distal branch of the minor veinlet. *Indusium* soon broken into fragments, silky, membranous, whitish or very pale fawn, the margin with fine white fimbriae or atropurpureous spinules. *Receptacle* globular, about 0.1 mm. in diameter. *Paraphyses* pale fawn or red and white, sometimes branched, not prominent, shorter than the sporangia, not numerous. *Sporangia* with a complete, oblique annulus consisting of 18 to 24 cells with thick, dark red walls and 10 to 11 thin-walled cells, the pedicel short and thick. *Spores* tetrahedral, pale yellow, trilete, smooth when immature, later papillose, 35 to 45 μ x 37 to 51 μ. Plate X.

DISTRIBUTION: Central-eastern to south-eastern Queensland, New South Wales (coast and dividing range) and eastern Victoria.

LECTOTYPE: Fern tree creek, Bunya Mount, Leichhardt, 28.12.1843 (MEL.). I have been unable to find a specimen labelled "Moreton Bay, Leichhardt" amongst the copious syntype material at Melbourne National Herbarium and the Kew Herbarium. F. Mueller often used the locality "Moreton Bay" in a wide sense to mean the hinterland of the Moreton Bay district and the Bunya Mountains are only about 80 miles N.W. of Brisbane. Mueller would certainly have examined this specimen when writing his description of the species, as was pointed out by Mr. J. H. Willis of the Melbourne National Herbarium. The specimen collected by Leichhardt would be the obvious choice as the lectotype, since the species was named after him.

Syntypes (all examined): *Queensland*: between Dorenda and the Glasshouses, fern-tree 12 ft. high, C. Moore (MEL.), presumably the specimen quoted by Mueller in Fragm. Phyt. Austr., V (1865), 53, as "Glasshouse Mountains, C. Moore". *New South Wales*: Mt. Lindsay, thickly wooded place high up on the range, caudex 9 ft. high, 1 ft. in circumference, W. Hill (MEL.); Clarence River, Beckler (MEL.); Macleay River, H. Beckler (MEL.); Hastings River, H. Beckler (MEL.; K.); near Parramatta, W. Woolls (MEL.); Valley of Avoca, Blue Mountains, C. Wilhelmi, 11.1863 (MEL.), presumably the specimen quoted by Mueller as "Avoca, Neo Cambriae, C. Wilhelmi"; Blue Mountains, L. Atkinson (MEL.); Illawarra, Shep(h)erd (MEL.) and (K.); Illawarra, C. Moore, 1855 (K.).

Specimens Cited: *Queensland*: Mulgrave, F. M. Bailey (BRI.); Eumundi, J. H. Simmonds (BRI.); Yandina, Field Naturalists, 1.3.1891 (BRI.); Maroochie, F. M. Bailey, 7.1879 (BRI.); Woombye, between Gympie and Brisbane, H. A. Longman, presented 9.1931 (K.); Buderim Mountain, C. T. White (NSW. P1709; BRI.); base of Buderim Mountain, rain forest, tree-fern about 4 ft. high, leaves shining green, S. T. Blake No. 5248 and E. and M. Middleton, 2.3.1934 (BRI.); Mt. Mee, near Dayboro, Moreton district, alt. 800-900 ft., tree-fern short or up to 8 ft. (high), very slender, covered with decurrent leaf-bases, ramentum scanty, leaves about 6 ft. long, deep green above, paler beneath, S. T. Blake, No. 12940, 2.5.1937 (BRI.); Blacksnake Creek, Little Yabba Forest Reserve, near Conondale, small slender tree-fern on edge of creek in rain forest, D. A. Goy and L. S. Smith No. 671, 9.4.1939 (BRI.); Upper Cedar Creek, near Samford, about 20 miles N.W. of Brisbane, D. A. Goy and L. S. Smith No. 51, 19.12.1937 (BRI.; BM.); Tambourine Mountain, C. T. White, 1.1916 (BRI.); Tambourine Mountain, J. Shirley (NSW. P4694); Mt. Tambourine, ca. 2,500 ft., stipe about 12 ft., M. D. Glynne No. 46, 5.1929 (K.); Upper Currumbin Valley (near Coolangatta), in rain forest, hanging over creek, sandy red soil, G. K. Jackson, 1.1931 (K.); Upper Tallebudgera, C. T. White, 12.1917 (BRI.); Lamington National Park, Moreton district, alt. 3,000 ft., common in rain forest, tree-fern with smoothish trunk marked for most of its length or in the lower part only with round smooth scars, C. T. White No. 11894, 26.11.1942 (BRI.); Springbrook, alt. 3,000 ft., tree-fern in dense rain forest, D. A. Goy and L. S. Smith No. 204, 30.1.1938 (BRI.); Roberts' Plateau, Lamington National Park, trunk very stout, C. T. White, 3.1920 (BRI.; BM.); Mt. Ballow, alt. 3,500 ft., in *Nothofagus* forest, C. T. White No. 11112, 25.7.1937 (BRI.).

New South Wales: Macpherson Range, alt. 3,500 ft., No. 3, C. T. White No. 12809, 12.1918 (BRI.; NSW. P1371), very robust form; Mt. Lindsay, border of N.S.W. and Q., C. T. White, 10.1921 (BRI.); Mt. Lindsay, W. Forsyth, 9.1901 (NSW. P1706); Mt. Lindsay, J. L. Boorman, 3.1916 (NSW. P1708, P4686, P4696); Uki, Upper Tweed River, J. L. Boorman, 8.1916 (NSW. P4688); Tweed River, Guilfoyle, 1871 (MEL.); Cooper's Creek, via Mullumbimby, large tree-fern on hillside in rain forest, D. A. Goy No. 153, 26.8.1936 (BRI.; BM.); Burringbar, E. Betche, 3.1896 (NSW. P4687); Brunswick Heads, J. C. Wiburd, 8.1938 (NSW. P1707); Brunswick River, J. H. Maiden and J. L. Boorman, 12.1903 (NSW. P1705); Richmond River, North Arm, J. H. Simmonds, 1897 (BRI.); Tenterfield scrub, frond 10 ft. long, caudex 8-10 ft. high, C. Stuart No. 1078 (MEL.); 10 miles north of Coffs Harbour, in rain forest, L. A. S. Johnson, 9.1947 (NSW. P5172); Dorrigo, in rain forest gully, M. Tindale, 26.4.1944 (NSW. P1757 and P1758); Macleay River, R. Fitzgerald, 1870 (MEL.); Port Macquarie, J. L. Boorman, 6.1915 (NSW. P4689); O'Sullivan's Gap, about 20 miles south of Nabiac, L. Gilbert, 30.11.1946 (NSW. P764); Barrington Tops district (i.e., Upper William's River district), L. Harrison, 5.1925 (NSW. P4680, P4684 and P1759); Upper William's River, L. Fraser and J. Vickery, 11.11.1936 (NSW. P4681); between Massey's Creek and Upper Paterson River, H. M. R. Rupp, 10.1925 (NSW. P4685); Gosford, 10.1888 (NSW. P4679); Mt. Irvine, alt. 2,500 ft., 10 ft. high, upright spreading habit, rain forest, basalt formation, E. F. Constable, 23.3.1950 (NSW. P6270; BM.); Mt. Wilson, J. H. Maiden, 3.1902 (NSW. P1704); Hippocrene Falls, Valley of the Waters, Blue Mountains, sandstone country, rain forest, alt. 1,400 ft., caudex 7 ft. high, narrow, E. F. Constable, 7.2.1949 (NSW. P5647; MO.; BM.); Mt. Kembla, J. J. Fletcher, 9.11.1891 (NSW. P4697); Illawarra, E. B. Heyne (MEL.); Bulli, S. Johnson, 1875 (MEL.); Conjola, W. Heron, 5.1899 (NSW. P4683).

Victoria: Mt. Drummer Jungles, N. A. Wakefield, 10.9.1939 (MEL.) and (NSW. P4693); Mt. Drummer, F. Robbins, 14.3.1937 (MEL.); Howe Ranges (granite), extreme east of Victoria, N. A. Wakefield, 8.2.1943 (MEL.).

Cyathea leichhardtiana is also recorded from Bruthen which is 90 miles west of Mt. Drummer, Victoria. According to Mr. L. S. Smith, of the Brisbane Herbarium, the most northerly record of *C. leichhardtiana* is the Eungella Range which is near Mackay, Queensland.

Absolute Synonym: *Alsophila leichhardtiana* F. Muell., Fragm. Phyt. Austr., V (7.1865), 53 and (2.1866), 117; F. M. Bail., Handb. Ferns Queensl., (1874), 57 (as *A. leichhardtii*); Benth., Fl. Austr., VII (1878), 711; F. M. Bail., Lith. Ferns Queensl., (1892),

t. 38; Moore et Betche, Handb. Fl. N.S.W., (1893), 506; F. M. Bail., Queensl. Fl., VI (1902), 1949; C. Chr., Ind. Fil., (1905), 44; Domin in Bibl. Bot., LXXXV, 1 (1914?), 35; Maiden et Betche, Census N.S.W. Pl., (1916), 1; Mclvaine, Check List N.S.W. Pter., Proc. Linn. Soc., N.S.W., LXI, 3-4 (1936), 115.

Equivalent Synonyms: *Alsophila macarthurii* Hook. in Hook. et Bak., Syn. Fil., ed. 1 (11.12.1866), 40, based on the following Syntypes which I have examined: woods near Sydney, W. Macarthur No. 211, 1854 (K.), Hastings River, Beckler (K.) and Illawarra, Shepherd (K.), the first two specimens were labelled *A. macarthurii* by W. J. Hooker; *Alsophila moorei* J. Sm., Ferns Br. and For., (1866), 245, based on *A. macarthurii* Hook.; *Hemitelia australis* Pr., Epim. Bot., (1849), 33; C. Chr., Ind. Fil., (1905), 347; M. Tindale in Contrib. N.S.W. Nat. Herb., II, 1 (1953), 8, Holotype "arbor, Australasia, Hügel" (W., seen); *Amphicosmia australis* T. Moore, Ind. Fil., II (1857), 59, based on *Hemitelia australis* Pr.; *Cyathea australiensis* Domin, Pterid., (1929), 263, based on *Hemitelia australis* Pr., non *Alsophila australis* R. Br. (1810).

Alsophila moorei J. Sm. is based on *A. macarthurii* Hook., but no specimens were cited by J. Smith, although the distribution was given as New South Wales. None of the sheets at the Herbarium of the Royal Botanic Gardens, Kew, were labelled *Alsophila moorei* by Smith but a number have *A. macarthurii* Hook. MSS. written upon them in Hooker's own handwriting. The original description of *A. moorei* is at variance with that of *Cyathea leichhardtiana* in that the "laciniae" (i.e., the ultimate segments) are said to be entire, whereas those of the latter are always sharply denticulate.

Cyathea leichhardtiana is closely related to *C. tripinnata* Copel. which has a wide distribution in the Philippines, British North Borneo, New Guinea and Pulau Tioman. The principal differences between the two species are as follows:—

C. leichhardtiana	*C. tripinnata*
1) Indusium of the young and mature sori not visible without a lens; whitish, almost hyaline, membraneous.	1) Indusium of the young and mature sori visible without a lens, light stramineous, papyraceous, cup-shaped at first, soon breaking into segments.
2) Margin of the tertiary segments usually mucronate.	2) Margin of the tertiary segments crenate.

C. tripinnata and *C. leichhardtiana* have a large number of points of similarity. Both species have dark green fronds which are paler on the lower surface. The bases of the stipes are clothed with scales which are linear, thinly papyraceous, white or pale stramineous, beset with minute, dark red, apical and marginal setae. The freely aculeate stipes have dark, sharply-pointed spines which are 1 to 3 mm. long and up to 0.5 mm. broad at the middle, the apices of these spines being easily broken off. The primary and secondary rhachises are also usually freely aculeate with short prickles on their lower surfaces and are densely clothed with fawn, caducous squamules which have dark red, marginal setae. The stipes and rhachises are mostly atropurpureous, although *C. tripinnata* occasionally has black axes and those of *C. leichhardtiana* are sometimes bright red-brown. In both species the sori are very close to the costules and the paraphyses are much shorter than the sporangia.

The scales on the lower surface of the costae are not dissimilar in these two species, as both have yellowish-white scales with dark red or atropurpureous, marginal setae. Sometimes these scales are partly yellowish-white and partly reddish-purple or atropurpureous. A number of smaller, fawn, irregularly fimbriate scales are also present in both species on the lower surface of the costae.

Both species are closely related to *Cyathea celebica* Bl., *C. truncata* (Brack.) Copel. and *C. quadripinnatifida* Copel.

11. Cyathea cooperi (*Hook. ex. F. Muell.*) *Domin,* Pterid., (1929), 262.

Habitat along creeks often in high mountain gullies. *Habit* arborescent, the caudex up to 10 m. high, mostly covered with large, oval, clean-cut scars. *Stipes* (Pl. XIV) not winged, nearly always deciduous, very slightly curved, deeply sulcate above, light yellowish-brown or brown, 0.8 to 3 cm. broad, freely muricate with dark brown, obtuse protuberances 0.2 to 0.5 mm. long; basal scales whitish, silky, thin, linear (more than 12:1) to cultrate (6:1), 2-5 cm. long, 0.3-5 mm. broad at the base, with dark red, marginal setae and usually with dark red, spine-like apices, intermixed with smaller, less conspicuous scales which are red-brown or brown, 0.6 to 1.5 cm. long, 0.1 to 0.3 mm. broad, with setose margins; a few scales of an intermediate type also occur; surface of the stipes scurfy-paleate with dark red, simple or branched, bristle-like squamules with chaffy bases, both surfaces clothed with light brown or white, branched, substellate hairs and a few, linear, dark red or chestnut scales with spinulose margins. *Primary rhachises* light yellow-brown, slightly darker above, 3-sulcate above, glabrescent and more or less muricate with obtuse, brown protuberances below, clothed above with appressed, jointed, yellow-brown or fawn, strigose hairs, dark chestnut coloured scales with spinulose margins and also a few squamules. *Secondary rhachises* strigose above, clothed below and on the sides with substellate, dark chestnut, dark red or silvery scales which are linear (more than 12:1) to lanceolate (3:1), with spinulose margins; a few, tawny squamules also on the lower surface. *Costae* light yellow-brown or red-brown, slightly darker above, more or less muricate with small, brown, obtuse protuberances, the costular bases clothed below with dark chestnut, linear (more than 12:1) to narrowly lanceolate (6:1) scales with spinulose margins, a few tawny squamules and dark red, fawn or white, substellate scales scattered along the costae. *Fronds* 3-pinnate at the base, green or light green, paler on the lower surface, sometimes subglaucous, membranous to thinly coriaceous, up to 4 m. long, 22 to 130 cm. in diam., usually 13 to 18 in number, tufted and somewhat spreading, rather abruptly narrowed towards the apex but less so towards the base. *Primary pinnae* with unwinged petiolules which are 0.4 to 18 cm. long in the basal pairs, narrowly oblong (3:1) to oblong (2:1), slightly broader towards the middle, 25 to 65 cm. long, 5.5 to 26 cm. (mostly 11 to 20 cm.) broad, the apex abruptly acuminate. *Secondary pinnae* stalked, the petiolules not winged except in the upper pinnae, 13 to 26 pairs, narrowly oblong (3:1) to cultrate (6:1), horizontal or slightly erecto-patent, the apex abruptly acuminate. *Tertiary segments* dissected to the costa or with a few of the basal pairs stalked and free, the upper and middle segments joined at the base, the middle segments dissected to within 1 mm. of the costa; alternate, 10 to 23 (mostly 16 to 20) pairs, markedly falcate, cultrate (6:1) to narrowly oblong (3:1), 4 to 17 mm. long, 1.3 to 4 mm. broad, the apex subacute or more usually broadly rounded, the margin irregularly denticulate or rarely deeply lobed, the base (if free) hastate or unequally sided, otherwise broadly dilated. *Costules* glabrous above or with a few strigose hairs, clothed below with a few, white, fawn or chestnut, substellate scales (Pl. XI, fig. 1) and towards the apex with a few, unbranched, septate, strong, yellowish or hyaline hairs with persistent bases. *Minor veinlets* oblique, once to three times forked but in rare cases pinnate at the base of the ultimate segments, usually 6 to 11 pairs, glabrous above and below, or with a few, simple, septate hairs below. *Sori* with a false indusium, orbicular, 0.5 to 1 mm. in diam., 1 to 10 pairs per ultimate segment, medial or subcostular, situated on the only fork of the minor veinlet or on the upper forks, but never forming a double row. *Indusium* consisting of a ring of white, red and/or dark chestnut, substellate scales. *Receptacle* small, ovoid, brown or black, fawn-furfuraceous. *Paraphyses* simple, numerous, septate, about the same length as the sporangia, the apex red or fawn and usually rather swollen. *Sporangia* with a complete, oblique annulus of 18 to 20 thickened cells and 10 to 11 unthickened cells including the stomium, the pedicel short and thick. *Spores* tetrahedral, trilete, smooth when immature, later papillose, 30 to 38μ x 36 to 43μ.

Distribution: North-eastern Queensland to the Illawarra district (South Coast) of New South Wales.

Type Collection: In Fragm. Phyt. Austr., V (1866), 117, Mueller cited three localities, where Woolls and Macarthur had collected specimens of *C. cooperi*, namely at Dapto, at the bases of the Baliac Mountains, and 3-4 English miles towards Wollongong. I have been unable to trace the specimens from the first two localities at the Kew Herbarium or any of the Australian herbaria. I have chosen "Wollongong, Woolls (MEL.)" as the lectotype. At Kew there is a specimen which is probably a duplicate of the lectotype, namely, "near Wollongong, tree-fern 12 ft. high, sometimes 20 ft., ex Herb. Mueller, 7.1877". I have chosen the Melbourne specimen as lectotype rather than "Hort. Veitch, 1804" ex Thomas Moore's Fern Herbarium, purchased 3.1885 (K.). In the first edition of Hooker and Baker's Syn. Fil. (12.1866), 40, they state that "a plant in every respect resembling the *A. excelsa*, has been sent living to Mr. Veitch, and has been cultivated in gardens under the name of *A. cooperi*, in compliment to Sir Daniel Cooper." Although this species was first distinguished by Hooker, F. Mueller's description was validly published before that of Hooker, so that a lectotype should be chosen from Mueller's three cited specimens.

Specimens Cited: *Queensland*: Cooktown tableland, in rain forest, trunk 3 ft. tall, very furry, fronds 10 ft. long, P. R. Messmer, 26.7.1952 (NSW. P2336); Stuart's Creek, Daintree River, juvenile foliage, P. R. Messmer, 9.8.1952 (NSW. P2771); Daintree River lowlands, L. J. Brass and C. T. White No. 307, 22.9.1937 (BRI.); Daintree River, 20 ft. high, stem 6 in. diam., fronds 12 ft. long, Fitzalan, 1875 (MEL.); Mossman River Gorge, rain forest, tree-fern, trunk up to 20 ft. high and 6 in. diam., covered with short, hard, black adventitious roots which are hidden on the upper part under a dense mass of soft, bright brown scales, fronds spreading, about 8 ft. long, stipes and rhachis muricate, upper surface channelled, lower densely covered with minute, brown scales; base of stipes appressed to the trunk, L. J. Brass No. 2109, 9.2.1932 (BRI.; GH.)*; Mt. Spurgeon, large tree-fern along creek in cleared scrub, C. T. White No. 10697, 9.1936 (BRI.); Upper Barron, C. T. White, 1.1918 (BRI.); Cairns-Kuranda Rd., in rain forest, 15 ft. high, scars of stipes cover trunk, P. R. Messmer, 11.8.1952 (NSW. P2760); Edge Hill, M. J. Manski, CAIRNS 3591, 13.6.1937 (BRI.); Cairns, W. W. Froggatt, 1886-7 (NSW. P783-4, P786-7); Herberton, R. F. Waller, 1908 (NSW. P1518); Cook district, Boonjee to Topaz, near Malanda, 2,300-2,400 ft. alt., common, tree-fern 10-15 ft. or so, with a rather untidy trunk, leaves to 10 ft. long, green, paler beneath, S. T. Blake No. 15208, 25.8.1943 (BRI.); Millaa Millaa, stem rough, not marked with leaf scars, L. J. Brass and C. T. White No. 142, 14.9.1937 (BRI.); Johnstone River, T. L. Bancroft (BRI.); Tully River, A. E. Brooke (BRI.); Rockingham Bay, ex Herb. R. H. Beddome (K.); between Cleveland Bay and Rockingham Bay, Hill, received 1.1866 (K.); summit of the Range back of Pt. Mackay, stem slender (MEL.); Mt. Perry, J. Keys (BRI.); Kin Kin, Francis and White, 3.1916 (BRI.); Eumundi, 11.1892 (BRI.); Eudlo, J. H. Simmonds (BRI.); Mapleton Falls, Blackall Range, C. T. White, 31.8.1921 (BRI.; NSW. P669); Mt. Mee, near Dayboro, along creek in rain forest, 800-900 ft., trunk slender up to 6 ft., covered with remains of fronds, fronds tufted, rather spreading, green above, paler beneath, S. T. Blake No. 12939, 2.5.1937 (BRI.); Moreton Bay, Herb. F. Mueller, 1871 (MEL.); Belmont, near Brisbane, tree-fern on sides of a deep gully in remnant of rain forest, C. T. White No. 6670, 15.3.1930 (BRI.); Toowoomba, L. Stephenson (NSW. P1494); Tambourine Mountain, C. T. White, 1.1916 (BRI.; NSW. P665); Beechmont, alt. 2,000 ft., C. T. White No. 6186, 31.8.1929 (BRI.); Canungra Creek, Lamington National Park, alt. about 1,500 ft., tree-fern fairly common along creek bank, stipes articulate at base leaving large oval scars on caudex, D. A. Goy and L. S. Smith No. 135, 11.1.1938 (BRI.); Springbrook, in remnant of rain forest, in cleared country, ca. 2,000 ft., tree-fern up to 10 ft. high, trunk rather slender, marked with diamond-shaped or rounded leaf-scars, fronds about 3 m. long with minutely warty stipes, S. T. Blake No. 15887, 14.8.1945 (BRI.; GH.); Cronin's Creek, between Mt. Barney and Mt. Ernest, tall slender tree-fern, trunk smooth and marked with oval leaf-scars, C. T. White No. 8743, 31.12.1932 (BRI.); foot of Mt. Barney, beside stream (Logan), about 6 ft., N. Michael No. 2274, 26.3.1936 (BRI.).

New South Wales: Mt. Lindsay, J. E. Tenison-Woods, 1875 (NSW. P739); Wiangaree State Forest, alt. 1,000 ft., tree-fern 12-15 ft. high, bases of stipes not persistent, edge of rain forest stream, E. F. Constable, 12.1.1953 (NSW. P4879); Richmond River, Hodgkinson, 1874 (MEL.); Tabulam, Richmond River, in a gully, "white, woolly stems with fronds falling away leaving scars", J. L. Boorman, 11.1904 (NSW. P505 and P1424); New England, head of Macleay River, fronds very glaucous beneath, high mountain gullies (NSW. P1420); Hastings River, Beckler (MEL.); John's River, J. L. Boorman, 11.1915 (NSW. P1423);

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* The labels must have been confused, as *C. cooperi* never has bright brown scales on the base of the stipes.

Dyer's Crossing, near Nabiac, via Taree, in rain forest, 4 to 6 ft. tall, fronds not persistent, L. Gilbert, 20.7.1946 (NSW. P557); ditto, beside creek, semi-rain forest, L. Gilbert, 16.8.1949 (NSW. P6228 and P6230; K.); within 25 mls. of Sydney, Stephenson, 1844, 1845 and 1846 (K.); Bulli, L. Johnson, 1875 (MEL.); Wollongong, L. Wooff (MEL.).

ABSOLUTE SYNONYMS: *Alsophila cooperi* Hook. ex F. Muell., Fragm. Phyt. Austr., V (1866), 117; Hook. et Bak., Syn. Fil., ed. 2 (1874), 459; Moore et Betche, Handb. Fl. N.S.W., (1893), 505; C. Chr., Ind. Fil., (1905), 41; Maiden et Betche, Census N.S.W. Pl., (1916), 1; Melvaine, Check List N.S.W. Pter., Proc. Linn. Soc. N.S.W., LXI, 3-4 (1936), 115; *Alsophila excelsa* R. Br. ex Endl. var. *cooperi* (Hook. ex F. Muell.) Domin in Bibl. Bot., LXXXV (1914?), 31; *Cyathea brownii* Domin var. *cooperi* (Hook ex. F. Muell.) Domin in Acta Bot. Bohem., IX (1930), 101.

EQUIVALENT SYNONYMS: *Alsophila hilleana* F. Muell., Fragm. Phyt. Austr., V (1866), 53, 116; ditto, VIII (1874), 179 (the first validly published description), LECTOTYPE, Dalrymple's Gap, Rockingham Bay, J. Dallachy, 21.11.1868 (MEL.)—chosen as the lectotype as this specimen is discussed by Mueller in more detail than the other syntypes; *Alsophila australis* R. Br. var. *cervicalis* F. M. Bail. in Queensl. Dept. Agric. Bull. No. 7 (Bot. Bull. 2), (1891), 22; F. M. Bail., Lith. Ferns Queensl., (1892), t. 33; Domin in Bibl. Bot., LXXXV, 1 (1914?), 31, TYPE COLLECTION, Johnstone River, plant grown in a bush house, Bowen Park, Colonial Botanist, 11.1890 (BRI.); plant in a bush house, received some years back from the Johnstone River, Colonial Botanist, 19.11.1890 (BRI.); Bowen Park, received from the Johnstone River, F. M. Bailey, 14.11.1890 (BRI., LECTOTYPE); *Alsophila australis* R. Br. var. *pallida* F. M. Bail. in Queensl. Dept. Agric. Bull. No. 7 (Bot. Bull. 2), (1891), 23; F. M. Bail., Lith. Ferns Queensl., (1892), t. 36; TYPE COLLECTION, plant growing in a bush house, Bowen Park, received 7 years ago from Johnstone River, F. M. Bailey, 14.11.1890 (BRI., LECTOTYPE); Johnstone River, off plant growing in a bush house, Bowen Park, Colonial Botanist, 11.1891 (BRI.); *Alsophila australis* R. Br. var. *excelsa* (R. Br. ex Endl.) F. M. Bail. in Queensl. Dept. Agric. Bull. (Bot. Bull. 2), (1891), 22, LECTOTYPE, between Cairns and Herberton, C. J. Wild (determined by F. M. Bailey). This was chosen as the lectotype, since no specimens from Maroochie were found.

In Fragm. Phyt. Austr., V (1866), 117, Mueller attributed the name *Alsophila cooperi* to Hooker. It appears to be the first validly published description of this species. There is no mention of it in the first edition of Hooker and Baker's "Synopsis Filicum" (12.1866) nor have I been able to trace an earlier description by Hooker. In the second edition of this book published in 1874, *A. cooperi* was attributed to Hooker without any mention of Mueller.

Cyathea cooperi was referred to as *Alsophila excelsa* R. Br. ex. Endl., in Hook. et Bak., Syn. Fil., ed. 1 (12.1866), 40; F. M. Bail., Queensl. Fl., VI (1902), 1949; F. Muell., Cens. Austr. Pl., I (1882), 137. In his earlier publication, Syn. Queensl. Fl., (1883), 690, F. M. Bailey considered *A. excelsa* to be a synonym of *A. australis,* not differing sufficiently to form even a good variety of the latter. In Bibl. Bot., LXXXV (1914?), 31, Domin reduced *A. cooperi* to a variety of *A. excelsa* but incorrectly attributed the combination to C. Moore in the Handb. Fl. N.S.W., (1893), 505, since Moore and Betche merely cited "*A. excelsa* R. Br. var." as a synonym of *A. cooperi.* In Pteridophyta (1929), 262, Domin regarded *Cyathea cooperi* as a good species but later in Acta Bot. Bohem., IX (1930), 101, reduced it to a variety of *C. brownii* Domin. The latter species is based on *A. excelsa* R. Br. ex Endl., a new name being necessary when this species was transferred to *Cyathea,* as *C. excelsa* Sw., of America, was already validly published. *C. brownii* appears to be confined to Norfolk Island but *C. cooperi* occurs on the mainland of Australia in Queensland and New South Wales, replacing *C. australis* as the commonest rain forest tree-fern in the north-east of Queensland. The differences between these two species were very clearly set out by W. W. Watts in Proc. Linn. Soc. N.S.W., XXXIX, 3 (1914), 770. *C. brownii* is a larger, more robust tree-fern than *C. cooperi.* Both are characterized by trunks covered with oval scars left by the deciduous bases of the stipes, also by two types of scales on the bases of the stipes but the larger scales are light brown in *C. brownii* instead of dull white as in *C. cooperi* and the smaller red-brown scales have stronger, more closely spaced setae in the former species. In *C. brownii* the scales of the costules are more mealy than in *C. cooperi,* the dark red, substellate scales being matted together with the weaker, hyaline, substellate paleae. The fronds of *C. brownii* are more thickly coriaceous than those of *C. cooperi,* so that the minor veinlets are less noticeable. The spores of the latter are more papillose than those of *C. brownii.* Through the courtesy of Dr. K. H. Rechinger of the Natural History Museum, Vienna, and Dr. G. Taylor, British Museum of Natural History, I was able to examine the type collection of *Alsophila excelsa,* collected on Norfolk Island by F. Bauer. There is also an isotype at the British Museum. The type of *C. brownii* is, of course, identical, as the name was based directly on *A. excelsa.*

I have examined the following syntypes in the National Herbarium, Melbourne, determined by F. Mueller as *Alsophila hilleana* or *A. excelsa* var. *hilleana*:—Port Denison, E. Fitzalan; Rockingham Bay, J. Dallachy, 21.11.1868; banks of Johnstone River, Hill; Dalrymple's Gap, 21.11.1868, tree-fern 6-8 ft. high . . . its fronds which are about 12 ft. long: the fern has a thick, strong, rough stem and at the base of the fronds full of dark brown, woolly hairs, J. Dallachy. However, I am unable to find any reasons why this should be considered as a distinct species from *C. cooperi.* Mueller stated that the segments of the pinnae in *A. hilleana* were larger, more obtuse and thicker than in the latter species, although in a wide range of specimens of *C. cooperi* I have not found that to be the case. The scales of the costules of *A. hilleana* are similar to those of *C. cooperi,* although white substellate scales are more common than red substellate scales. Unfortunately the paleae of the bases of the stipes are not present in any of the above mentioned specimens of *A. hilleana.* According to Mueller these bases were clothed with "dark brown hairs" but they probably referred to the narrow, dark red-brown scales which are so prevalent on the young, circinnate stipes of *C. cooperi.*

SPECIES OF UNCERTAIN OCCURRENCE IN AUSTRALIA.

Cretziou in Fedde Repert., L (1941), 304, records *Cyathea extensa* (Forst. f.) Sw., from Australia. I have examined Forster's and Swartz's type material of this species in the Riksmuseum, Stockholm, Sweden, but I have never seen any Australian material of this species. It is characterized by small, bullate, entire scales and simple hairs on the costules.

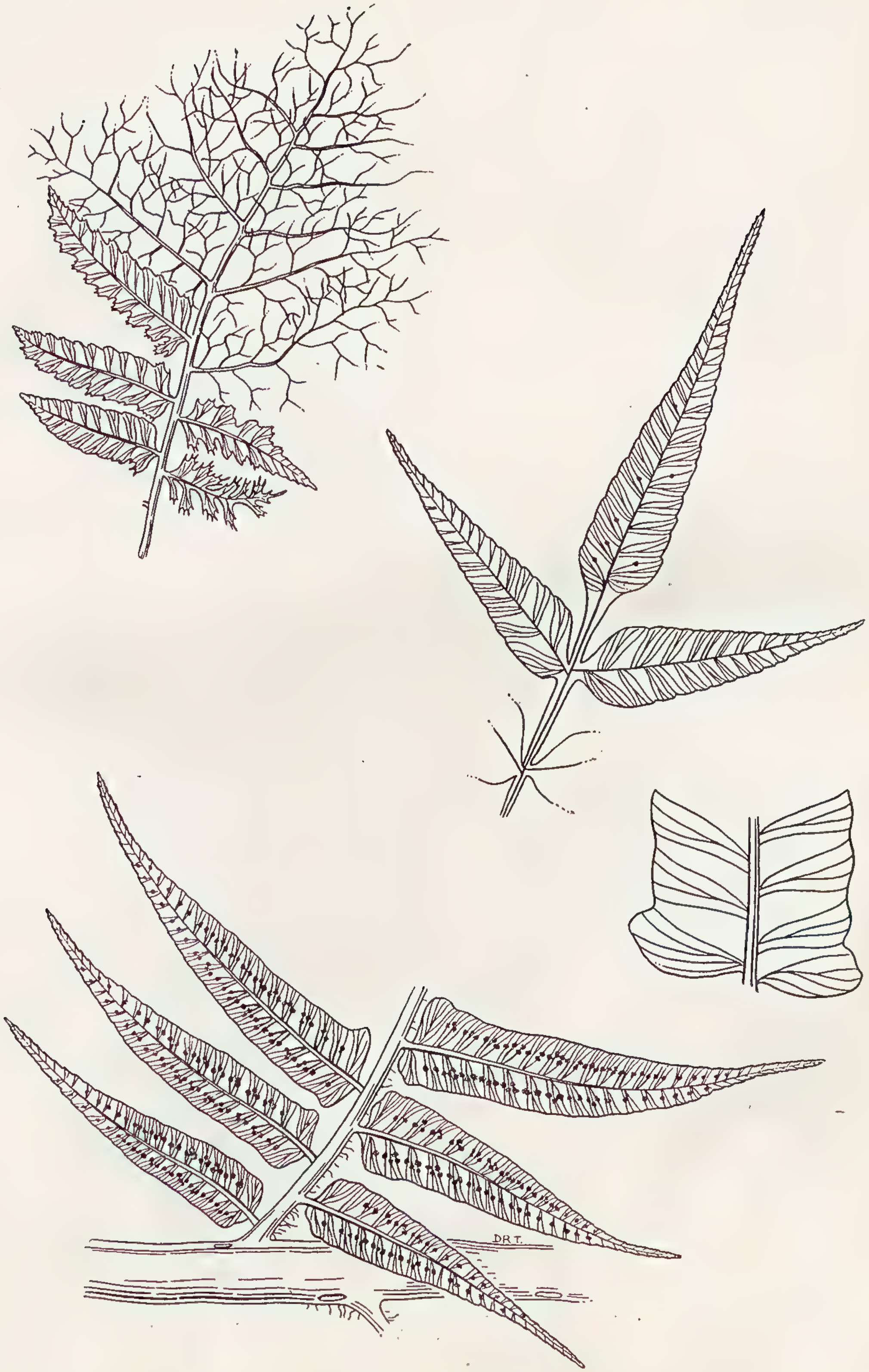
NAMES OF UNCERTAIN APPLICATION.

Hemitelia godeffroyi Luerssen in Journ. Mus. Godeffr., Heft VI (1873), 4. It has always been a matter of conjecture amongst Australian botanists whether this fern really belonged to the genus *Hemitelia,* so that it has been omitted from most floras of Australia. The holotype is "Brisbane River, Amalia Dietrich No. 26 (Catal. 1866)". By the courtesy of the Director, I have had the opportunity of examining a specimen from the Hamburgische Staatinstitute (No. 48β), labelled "ex Museo Godeffroy Hamburgensis, Queensland, Brisbane, A. Dietrich" which may be the type. As noted by Luerssen, l.c. (1873), 5, it had previously been determined as *Phegopteris rugosula* (Labill.) Fée (i.e., the species known today as *Hypolepis rugosula* (Labill.) J. Sm.). However, this specimen is undoubtedly *Culcita dubia* (R. Br.) Maxon, a common eastern Australian species with a creeping rhizome. There is no information as to whether the type of *H. godeffroyi* developed a trunk or not. Luerssen's description of *Hemitelia godeffroyi* agrees well with specimens of *C. dubia,* as both have the following characteristics:—silver-grey and golden-yellow hairs on the bases of the muricate stipes, 4-pinnate fronds, oblique annulus on the sporangia, numerous paraphyses each with a pointed terminal cell and brown, semicircular, ciliated, often tattered inner indusia. In *Hypolepis rugosula* the indusium consists of the recurved lobule of the ultimate segment, but the inner or true indusium, such as occurs in *C. dubia,* is missing, also the rhachises are red-brown or purplish-red in the former instead of straw-yellow. Luerssen was rather doubtful of the genus to which this fern belonged but placed it in *Hemitelia* chiefly because of the hemispherical indusia. *Hypolepis punctata* (Thunb.) Mett. also agrees fairly well with the description of *Hemitelia godeffroyi* except that it lacks the true inner indusium of the latter.

ACKNOWLEDGMENTS.

I should like to express my gratitude and appreciation for the facilities afforded by Mr. R. H. Anderson and by the directors and keepers of the herbaria mentioned on p. 329. In particular I wish to thank Dr. W. B. Turrill, Mr. F. Ballard and the staff at the Herbarium of the Royal Botanic Gardens, Kew, England, for their kindness, when I was privileged to work there for over two years and where a large part of this paper especially on subgenus *Gymnosphaera,* was completed. I am also indebted to the Council of the Linnean Society of New South Wales, as a section of this work was undertaken during my tenure of a Linnean Macleay Fellowship in 1948. I wish to thank Mr. H. K. Airy-Shaw for his generous assistance with nomenclatural problems, also Dr. P. Brough for his guidance in the early stages of my work on ferns. I am greatly indebted to Miss J. W. Vickery for reading the manuscript and offering much helpful advice especially about the illustrations. Special collections of *Cyathea* were donated or lent by Mrs. B. Molesworth-Allen, Dr. R. Melville, Mr. L. Gilbert, Mr. K. Kennedy, Mr. E. F. Constable and Mr. N. A. Wakefield. Dr. G. R. Proctor very kindly sent me four of his duplicates of *C. grevilleana* from Jamaica for comparison with specimens from Mt. Lindsay, N.S.W. In addition I wish to thank Prof. R. E. Holttum and Mr. G. P. De Wolf, Jr., for their valuable discussions by letter, especially on subgenus *Gymnosphaera,* also Mr. A. H. G. Alston for reading the manuscript. Mme. M. Tardieu-Blot, Mr. and Mrs. L. S. Smith, Mr. J. H. Willis and Dr. S. J. van Oostroom kindly assisted me in various ways. Plates IX and X of *C. baileyana* and *C. leichhardtiana* were drawn by Miss D. R. Thompson, formerly at the Kew Herbarium. The photographs were taken by the courtesy of the Government Printer of New South Wales.

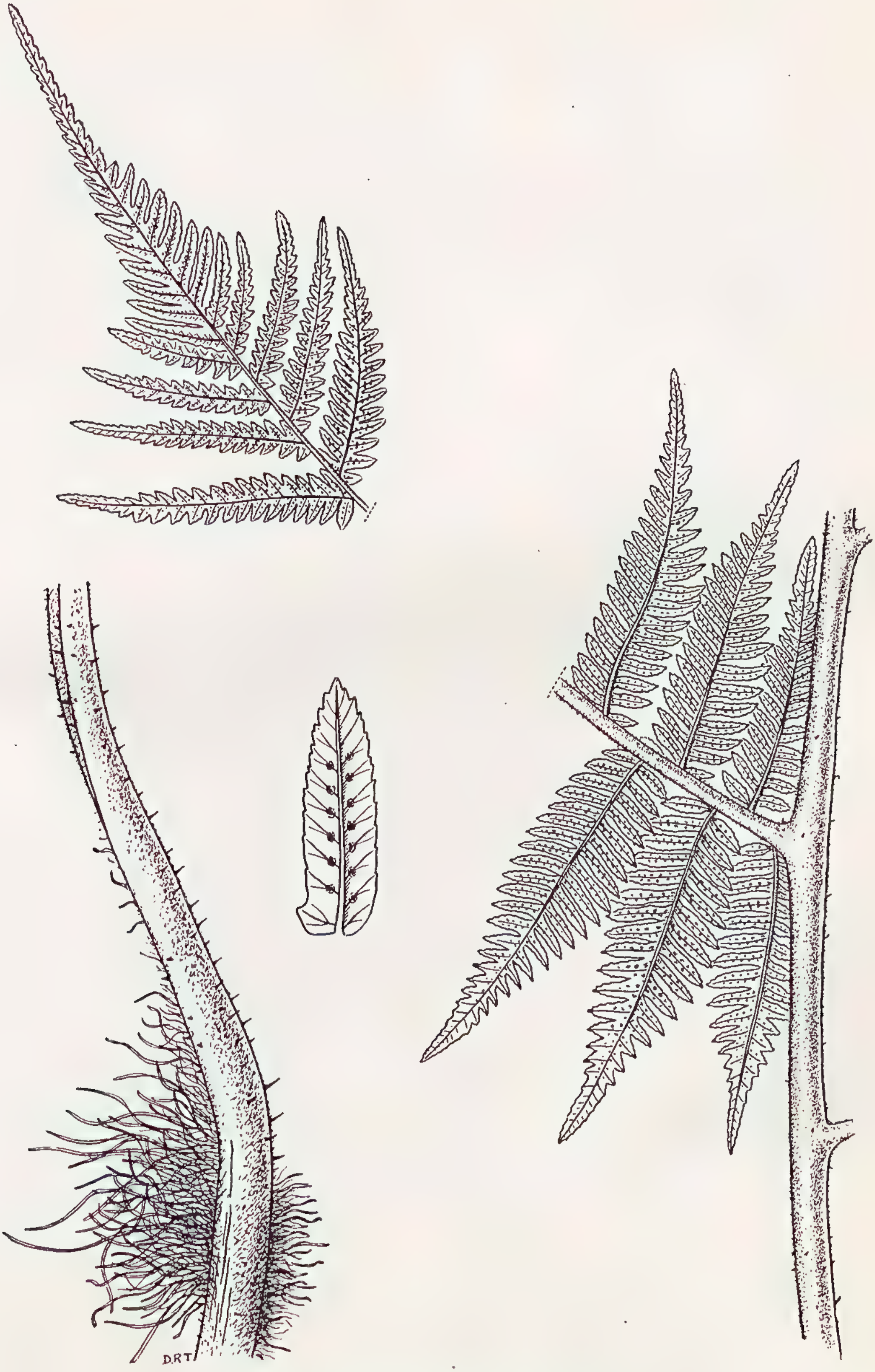
Plate IX. D. R. Taylor del.



Cyathea baileyana.

Upper left: a basal primary pinna showing the reduction of apical pinnules to intricately branched aphlebiae (NSW. P746), ¾ natural size. **Centre:** apex (NSW. P249) and base of a normal primary pinna (CAIRNS 2303), ¾ natural size. **Right:** portion of a pinnule showing venation (CAIRNS 2303), x 2.

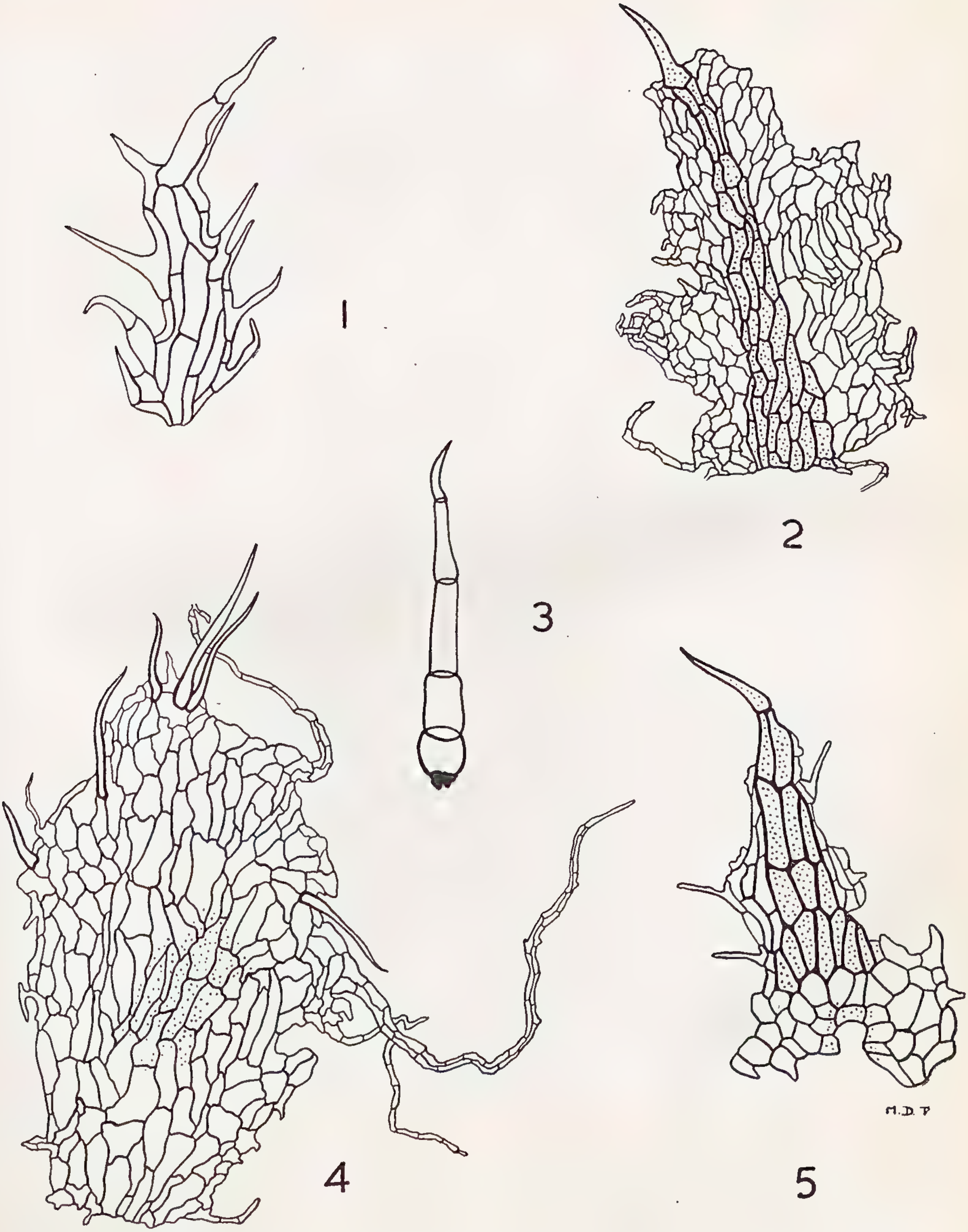
D. R. Taylor del.



Cyathea leichhardtiana (NSW. P5647).

Lower left: base of the stipe, ¾ natural size. **Centre:** ultimate segment of the lamina with sori, x 3. **Upper left and right:** apex and base of a primary pinna, ⅝ natural size.

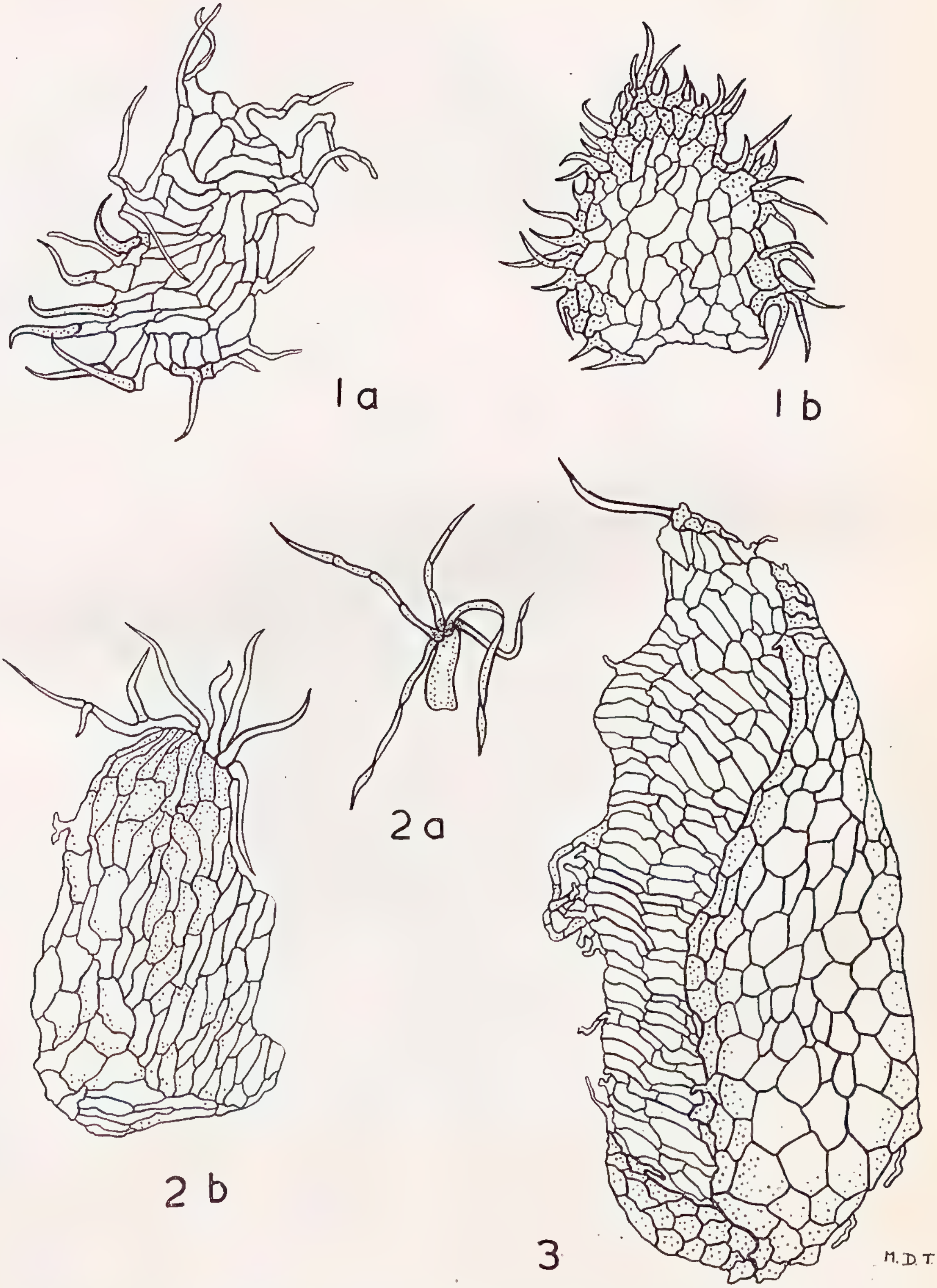
Plate XI. M. D. Tindale del.



1. *Cyathea cooperi* (NSW. P1424), scale of a costule. 2. *C. rebeccae* (NSW. P5573), scale of costa. 3. *C. robertsiana* (NSW. P5572), hair of costa. 4. *C. marcescens* (NSW. P239), scale of costa. 5. *C. baileyana* (*CAIRNS* 2303), scale of costa. Approx. × 112.

Plate XII.

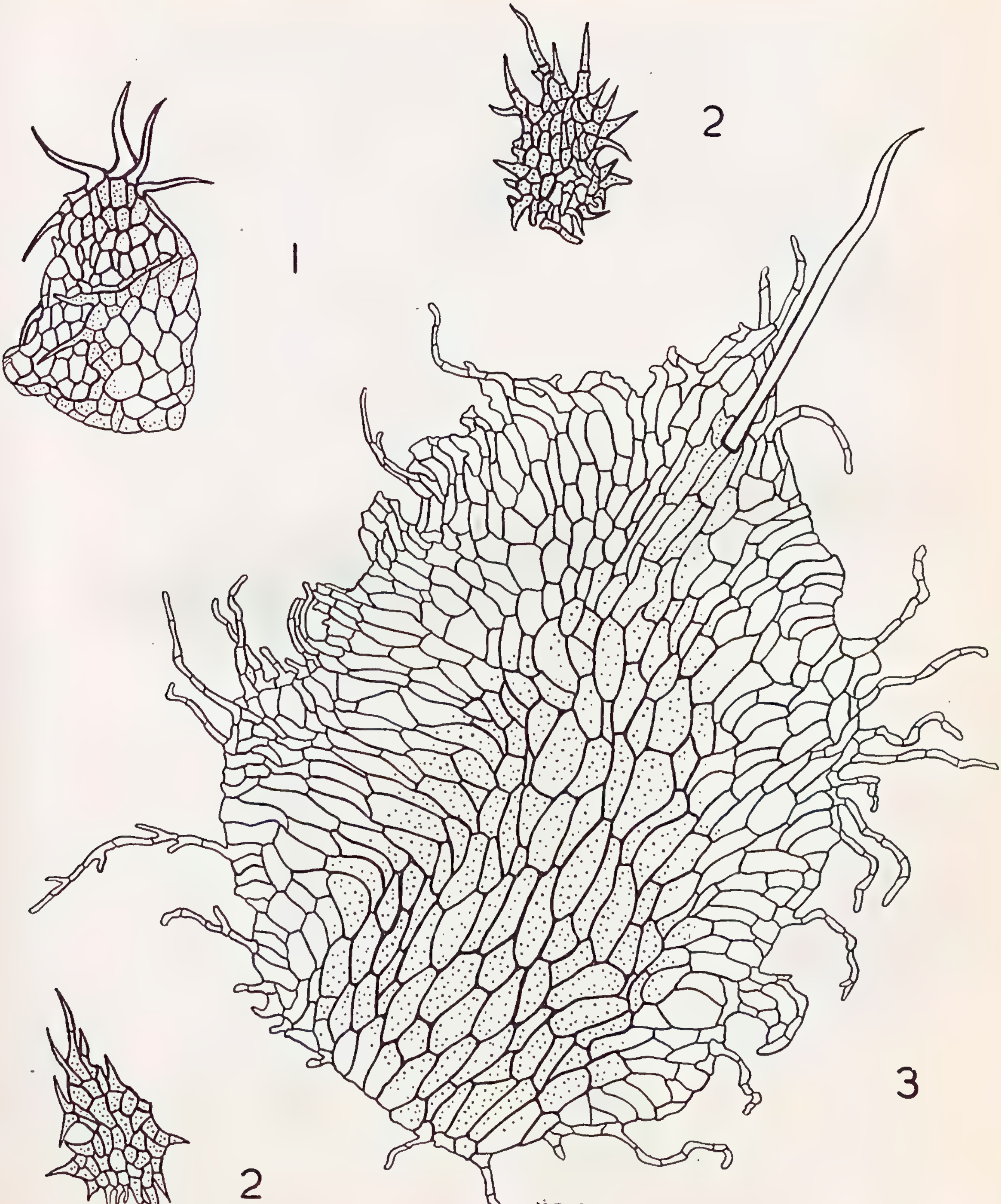
M. D. Tindale del.



1. *Cyathea celebica* (NSW. P782), a, squamule of costule. b, scale of costule. 2. *C. cunninghamii* (NSW. P691), a, stellate hair of costule. b, scale of costule. 3. *C. australis* (NSW. P6326), bullate scale of costa. Approx. x 112.

Plate XIII.

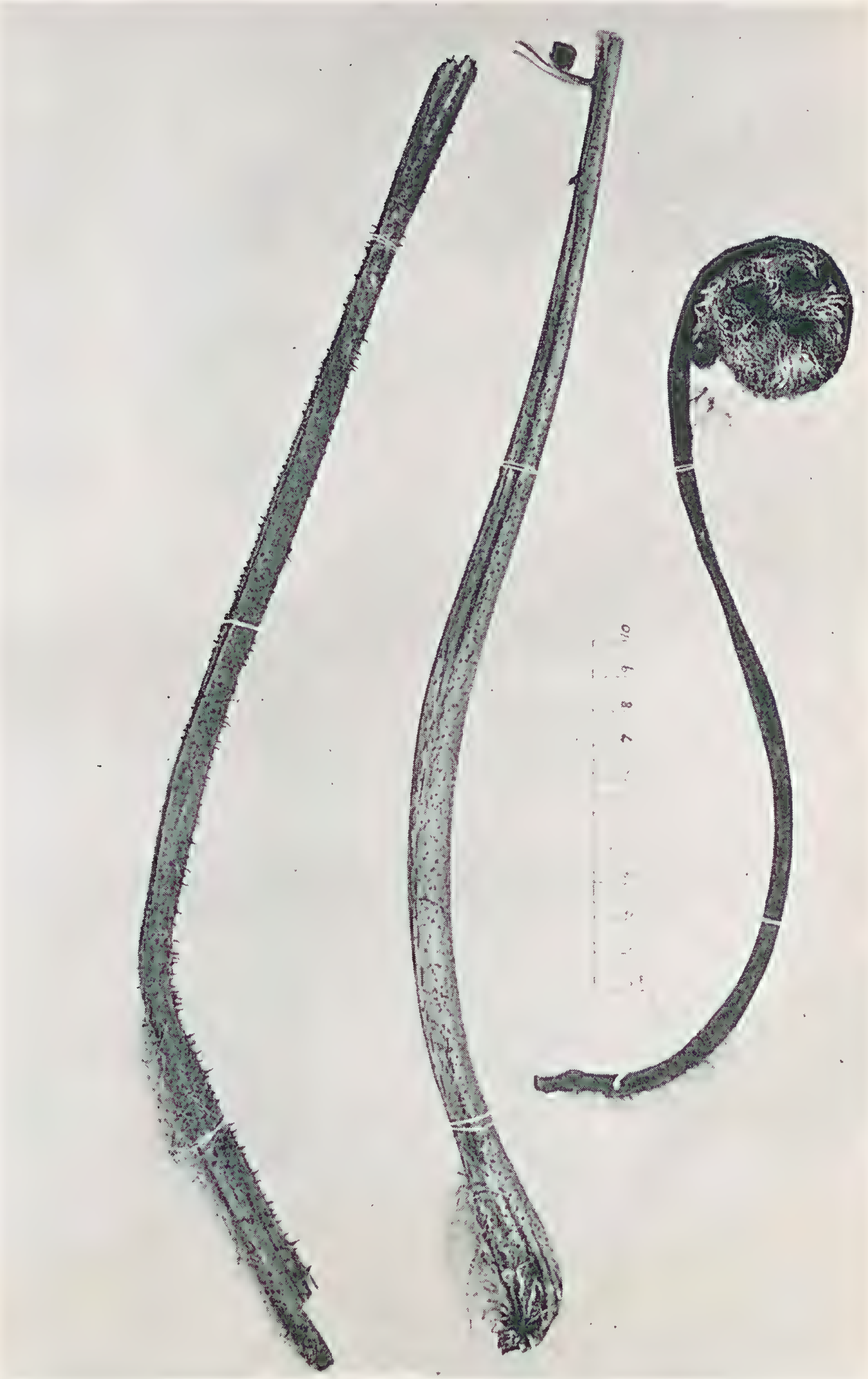
M. D. Tindale del.



1. *Cyathea grevilleana* (Proctor 4815), bullate scale of costule. 2. *C. leichhardtiana* (NSW. P4861), two scales of costule. 3 *C. woollsiana* (NSW. P1417), scale of costa. Approx. x 112.

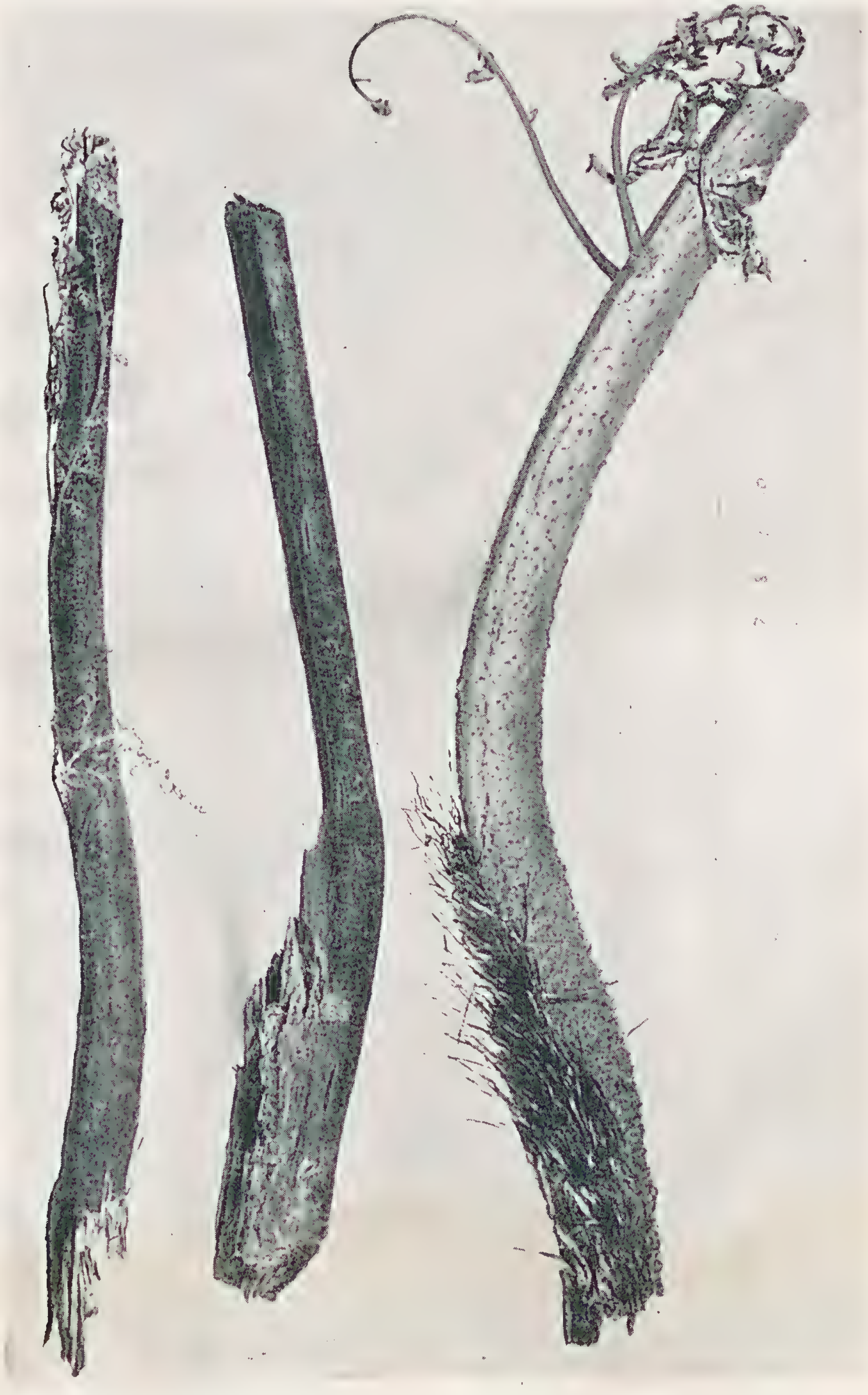
Plate XIV.

Photo by the Government Printer of N.S.W.



Left: *Cyathea leichhardtiana,* base of stipe with spines (NSW. P1758). **Centre:** *C. cooperi,* base of stipe (NSW. P6228). **Right:** *C. cooperi,* young circinnate frond (NSW. P6228).

Photo by the Government Printer of N.S.W.



Left: *Cyathea cunninghamii,* base of stipe (Melville 2821). **Centre:** *C. rebeccae,* base of stipe showing slit-like aerophores (NSW. P2356). **Right:** *C. australis,* base of stipe showing coarsely pointed, conical tubercles and dark brown scales (NSW. P6326).

Owing to unforseen delays the date of publication of Contributions from the New South Wales National Herbarium vol 2, No. 5 should read 21st. February 1957.

Editor.

a 225597

A Revision of the Genus *Callitris* Vent.

Joy Garden, B.Sc.Agr.

It has been recognised for some time that many of the specific names in common use for members of the genus *Callitris* are herbarium names of Robert Brown and Allan Cunningham not, or only subsequently, validly published in accordance with the International Code of Botanical Nomenclature. It has also become evident that many references to this genus in standard works give inaccurate and confusing accounts of species. For these reasons I consider that nothing short of a revision of the genus as a whole can serve to eliminate the confusion that has developed.

I have endeavoured to trace and identify all names applied to species of this genus and to place correctly most references and illustrations. I have examined a range of specimens, in the field as well as the herbarium, and all critical specimens, or their photographs, available to me.

The specific descriptions are not full in regard to such characters as habit and bark as I have tried to avoid the possibility of reproducing errors from previous accounts and have limited the descriptions to characters observable from herbarium specimens or recorded in recent reliable field notes.

The maps accompanying the descriptions give the distribution of each as shown by specimens actually examined.

I would like to acknowledge the valuable assistance given to me by Miss N. T. Burbidge, at that time Australian Liaison Officer at the Royal Botanic Gardens, Kew. Her sketches of specimens, selection of sheets for photographing and copying of pages from literature not available in Australia made this revision possible. I would also like to thank the Chief Scientific Liaison Officer, A.S.L.O., London; the Director, Royal Botanic Gardens, Kew; the Keeper of Botany, British Museum of Natural History; the Director, Muséum National d'Histoire Naturelle, Paris; the Director, Conservatoire et Jardin Botanique, Genève; the Director, National Herbarium, Melbourne; the Director, Museum of Applied Arts and Sciences, Sydney; the Chief of the Division of Plant Industry, C.S.I.R.O., Canberra and the Chief Botanist, National Herbarium, Sydney for assistance and facilities made available to me. My colleagues at the National Herbarium and many field-workers have shown a helpful interest during the progress of this study.

The following herbarium abbreviations have been used in this paper:—

B, Botanisches Museum, Berlin-Dahlem, Germany.
BM, British Museum of Natural History, London, Great Britain.
CANB, C.S.I.R.O. Division of Plant Industry, Canberra, A.C.T., Australia.
G, Conservatoire et Jardin Botanique, Genève, Switzerland.
K, The Herbarium, Royal Botanic Gardens, Kew, Great Britain.
MEL, National Herbarium of Victoria, Melbourne, Victoria, Australia.
NSW, National Herbarium of New South Wales, Sydney, New South Wales, Australia.
P, Muséum National d'Histoire Naturelle, Laboratoire de Phanérogamie, Paris, France.
TECH, Museum of Applied Arts and Sciences, Sydney, New South Wales, Australia.
W, Naturhistorisches Museum, Wien, Austria.

Callitris Vent.

Trees or shrubs, rarely attaining a great height and often considerably dwarfed in exposed situations, usually with a single trunk but occasionally the trunk branched near the base or the whole plant with a "mallee" habit i.e. several stems arising from below the soil level; bark usually hard, compact, furrowed and persistent but subfibrous in *C. macleayana.* Branches spreading, erect or fastigiate, the branching habit affected in some cases by external conditions; branchlets terete but the ultimate sometimes appearing angled owing to the decurrent leaf bases. Foliage green or glaucous; juvenile leaves needle-like, in whorls of 4, decurrent for only a small portion of their length, triangular in cross-section, usually found only on young plants but in some species persisting even on cone-bearing shoots; mature leaves in alternating whorls of 3, decurrent for most of their length, the short, triangular section at their upper end free but often appressed, the dorsal surface (as seen in dried specimens) rounded or prominently, often quite acutely, keeled. Cones monoecious. Male cones usually produced in large numbers, solitary and terminal or several together at and near the end of the branchlet, composed of alternate trimerous whorls of peltate sporophylls each bearing several sporangia on the under surface, the axis elongating when ripe, the pollen grains spherical. Female cones solitary or several together on short lateral branchlets; young cones composed of 2 whorls of 3 scales, or, on juvenile branches, of 4 scales, around a central columella, the scales joining at the base, after fertilisation, to form a single whorl, the ovules varying in number, according to the species, from 6 to more than 50; mature cones with woody, valvate scales, the scales smooth, wrinkled or warted on the dorsal surface and usually bearing a dorsal protuberance near the apex, the former outer whorl of scales usually short and not reaching the apex of the closed cone, the columella variable in size and shape but usually a narrow, pyramidal structure, the seeds usually numerous but often imperfect, borne on the base of the cone and the lower part of the scales, 1- or 2-winged, or occasionally 3-winged when borne at the junction of the cone-scales, the cotyledons 2; old cones falling after maturity in some species, in others remaining on the branches, often enlarging, for many years.

This genus is found over most of Australia and in New Caledonia. It occurs on a variety of soils but usually in well-drained situations. Several species produce valuable timber and several are grown as ornamentals.

KEY TO THE SPECIES.

1. Dorsal surface of the leaf rounded.

2. Cones solitary on slender fruiting branchlets, the cone-scales separating almost to the base in the mature cone.

3. A tropical species; cones usually 1.8 cm. or less in diameter .... *C. intratropica* 1.

*3. Not tropical species; cones often more than 1.8 cm. in diameter.

4. An inland species; foliage usually glaucous .... *C. hugelii* 3.

*4. A coastal species; foliage usually green .... *C. columellaris* 2.

*2. Cones solitary or several together on stout fruiting branchlets, the cone-scales failing to separate near the base in the mature cone.

5. Cones usually less than 2 cm. diameter .... *C. morrisonii* 5.

*5. Cones usually more than 2 cm. diameter .... *C. preissii* 4.

*1. Dorsal surface of the leaf keeled.

6. Western species; the dorsal surface of the leaf acutely keeled.

7. Cone-scales with a large, conical, dorsal point .... *C. roei* 6.

*7. Cone-scales with the dorsal point vestigial or absent ...... *C. drummondii* 7.

*6. Eastern species; the dorsal surface of the leaf prominently and obtusely or, in some species, acutely keeled.

8. New Caledonian species; the cones on slender fruiting branchlets.

9. Leaves usually 0.4-0.6 cm. in length .... *C. sulcata* 8.

*9. Leaves usually 0.3-0.4 cm. in length .... *C. neocaledonica* 9.

*8. Australian species; the cones on stout or, in some species, slender fruiting branchlets.

10. Dorsal surface of the leaf acutely keeled.

11. Cones on slender fruiting branchlets .... *C. baileyi* 10.

*11. Cones on stout, often glaucous, fruiting branchlets .... *C. macleayana* 11.

*10. Dorsal surface of the leaf prominently, but not acutely, keeled.

12. Leaves usually 0.4 cm. or more in length.

13. Cones usually depressed-globular ...... *C. muelleri* 12.

*13. Cones ovoid .... *C. oblonga* 13.

*12. Leaves usually 0.4 cm. or less in length.

14. Columella large, broadly 3-lobed ...... *C. monticola* 14.

*14. Columella short, 3-lobed or 3-partite or with 3 or 4 separate parts.

15. Cone-scales with a short, broad, conical, dorsal protuberance .... *C. rhomboidea* 15.

*15. Cone-scales with a small dorsal point .... *C. endlicheri* 16.

1. C. intratropica R. T. Baker et H. G. Sm., Pines of Australia (1910) 172.

TYPIFICATION: *Lectotype*: Arnhem Land, Mueller (K, photograph CANB).

SYNONYMS: *Frenela robusta* A. Cunn. ex Parl. var. *microcarpa* A. Cunn. ex Benth., Fl. Austr. VI (1873) 237. Lectotype: Arnheim's Land (K, photograph CANB) (labelled *Frenela intratropica* F. Muell.). I have chosen this specimen as lectotype because Cunningham's specimen from York Sound is an unidentifiable fragment. Bentham cites a number of specimens most of which are not *Callitris intratropica*.

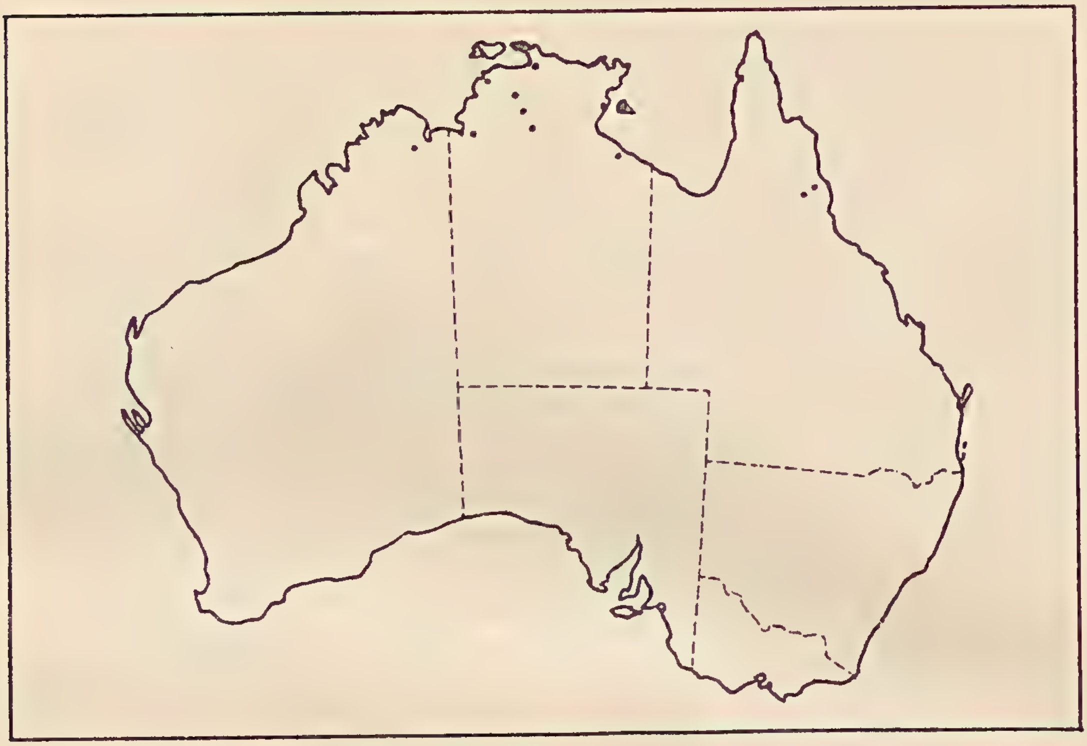
Frenela intratropica F. Muell. ex Benth., Fl. Austr. VI (1873) 237 in synon. Holotype: Arnheim's Land (K, photograph CANB).

Frenela microcarpa A. Cunn. ex Benth., Fl. Austr. VI (1873) 237 in synon. (Holotype: York Sound, N.W. Coast, A. Cunningham No. 287, 9.1820 (K, photograph CANB)) is almost certainly this species.

ILLUSTRATIONS: Baker et Smith, Pines of Australia (1910) 36.

A tree, often glaucous, with spreading or rather erect branches. Leaves usually 0.2 cm. long, the dorsal surface not keeled. Mature male cones not seen. Female cones solitary on slender fruiting branchlets, rarely remaining on the branches long after maturity, usually depressed-globular, up to 1.8 cm. diameter. Cone-scales 6, thin, each with a small dorsal point below the apex, the alternate scales shorter and very narrow, the larger scales angled, often sharply, into a broad short apex, all separating almost to the base of the cone and often spreading widely after maturity. Columella variable, usually simple and 3-angled. Seeds numerous, chestnut-coloured, with 2 wings often 0.4 cm. wide.

SPECIMENS EXAMINED: See Map 1. *Queensland*: Telegraph Station, Cape York Peninsula, McDonell, 3.1909 (TECH); Kambul, near Mareeba, White No. 1522, 3.1922 (NSW 22809); Mareeba, Jolly, 7.1915 (TECH); Alma-den, Cambage No. 3879, 8.1913 (NSW 22808).



Map 1. Distribution of *C. intratropica.*

Western Australia: 9 miles north-east of Karunjie Station, Perry No. 3161, 7.1952 (NSW 24329).

Northern Territory: Coburg Peninsula, Bateman, 7.1950 (NSW 22801); Oenpelli, Specht No. 1094, 9.1948 (NSW 22799); Darwin, Allen, 7.1921 (NSW 22802); Port Darwin, Holtze, 10.1904 (NSW 22806); Botanic Gardens, Darwin, Allen, 7.1919 (NSW 22805); near Darwin, Spencer, 6-7.1911 (NSW 22803); Arnheim's Land (K; photograph CANB; MEL); Pine Creek, White, 6.1922 (NSW 22804); South Bay, Bickerton Island, Specht No. 608, 6.1948 (NSW 22798); Hemple Bay, Groote Eylandt, Specht No. 394 (NSW 22797); Katherine Creek, Spencer 6-7.1911 (NSW 22807); Maranboy to Mataranka, Garden, 7.1954 (NSW 28612); McAdam's Range to Victoria R., Mueller, 9.1855 (K; photograph CANB); 10 miles north of Booroloola, Perry No. 1780, 7.1948 (NSW 22800).

Other References: F. Muell., Census (1882) 109 incl. *Callitris preissii* and *C. hugelii* (as *C. verrucosa*); Ewart et Davies, Fl. N. Terr. (1917) 19 excl. Hermansburg specimen (as *C. robusta* var. *microcarpa*); Ewart, Handb. For. Trees (1925) 44 (as *C. robusta* var. *microcarpa*); Robertson, Recomm. For. Trees Austr. (1926) 243; Gardner, Enum. Pl. W.A. (1930) 4; Dallimore et Jackson, Handb. Conif., ed. 3 (1948) 211.

2. C. columellaris F. Muell., Fragm. V. (1866) 198.

Typification: *Holotype*: Ad ostium fluminis Richmond's River, Henderson. No specimen has been traced in Mueller's herbarium at Melbourne. Specimens at Kew and Sydney may be duplicates.

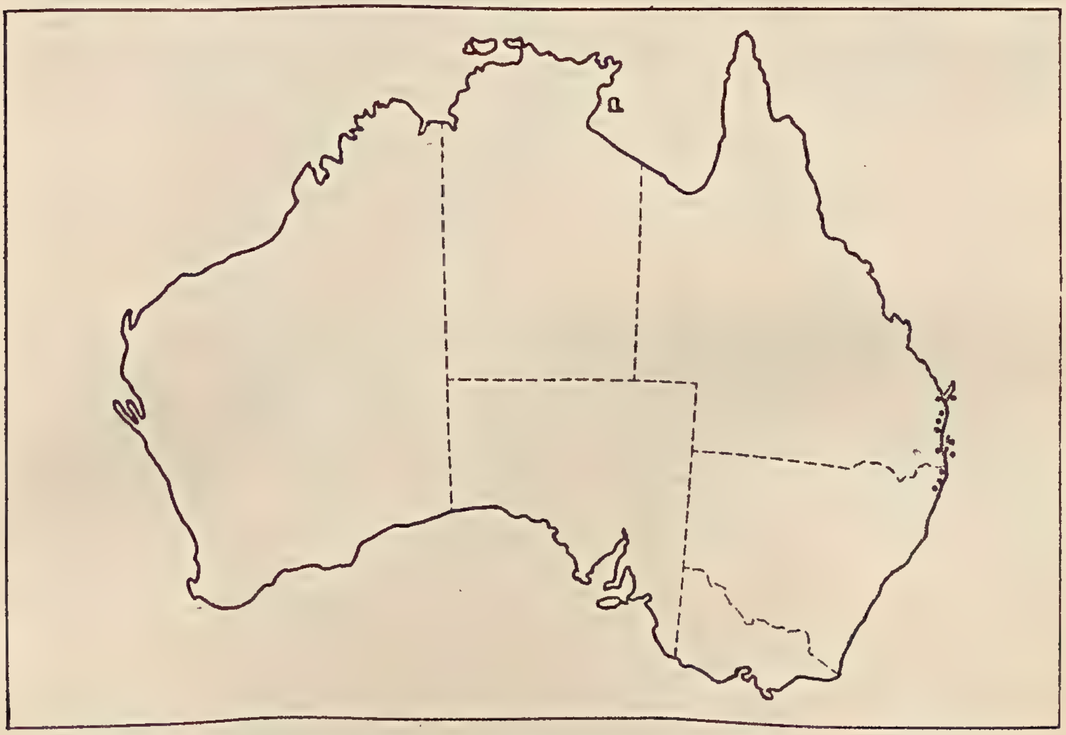
Synonyms: *Frenela moorei* Parl. in A. DC., Prod. XVI, pt. 2 (1868) 449. Syntypes: Ad Moreton Bay, Glass House, Clarence et Richmond Rivers, C. Moore.

Frenela columellaris (F. Muell.) Parl. in A. DC., Prod. XVI, pt. 2 (1868) 451.

Callitris arenosa A. Cunn. ex R. T. Baker et H. G. Sm., Pines of Australia (1910) 157 nom. illegit. Lectotype: Moreton Bay, A. Cunningham, 1829 (BM).

Illustrations: Maiden, Forest Flora (1907) pl. 47; F. M. Bail., Compr. Cat. Qld. Pl. (1909-1913) f. 511; Baker et Smith, Pines of Australia (1910) 36, 159, 160, 161 (as *Callitris arenosa*); Domin in Bibl. Bot. XX (1915) f. 61; Robertson, Recomm. For. Trees Austr. (1926) f. 36 (as *C. arenosa*).

A tree, occasionally glaucous, with spreading, ascending or fastigiate branches. Leaves usually 0.1-0.3 cm. long, the dorsal surface not keeled. Male cones cylindrical, up to 0.5 cm. long. Female cones solitary on slender fruiting branchlets, seldom remaining attached long after maturity, ovoid to depressed-globular, up to 2 cm. diameter. Cone-scales 6, thin, the dorsal point below the apex small or lacking, the alternate scales shorter and very narrow, the larger scales angled, often sharply, towards the apex, all separating almost to the base of the cone and often spreading widely after maturity. Columella very variable, up to 0.7 cm. long, often thick and angled. Seeds numerous, chestnut-coloured, with 2 wings often 0.4 cm. wide.



Map 2. Distribution of *C. columellaris.*

SPECIMENS EXAMINED: See Map 2. *Queensland*: Fraser Island, Petrie 6.1915 (TECH); Fraser Island, Queensland Forest Service, 12.1922 (TECH); Maryborough, Maiden, 3.1909 (NSW 22897); Noosa Heads, Johnson, 5.1951 (NSW 22896); Noosa Hill, Johnson, 5.1951 (NSW 22895); Bribie Island, White, 9.1920 (NSW 22893); Shores of Glasshouse and Moreton Bays of Cook (K; photograph CANB); Moreton Island (K; photograph CANB); Wellington Point, Moreton Bay, Cambage No. 4148, 7.1915 (NSW 22894); Brisbane, Boorman, 4.1899 (NSW 22891); Stradbrooke Island, White, 3.1915 (NSW 22892).

New South Wales: Backhouse (K; photograph CANB); Yelgun, Rooke-Jones, 9.1927 (NSW 22881); Brunswick Heads, Crumpton, 10.1921 (NSW 22882), 8.1921 (NSW 22876); Brunswick Heads, Rummery, 9.1921 (NSW 22886); Brunswick Heads, Cheel, 2.1934 (NSW 22878); Byron Bay, Betche, 3.1896 (NSW 22880); Byron Bay, Pope, 6.1904 (NSW 22877); Ballina, Halligan, 9.1913 (NSW 22875); Ballina, Maiden and Boorman, 11.1903 (NSW 22884); Ballina, Bauerlen, 9.1895 (NSW 22874); Richmond R., Henderson, (K; photograph CANB; NSW 22872; TECH), 6.1891 (TECH), 8.1891 (TECH); Ballina, Sharp, 2.1910 (TECH); Ballina, Welch, 3.1927 (TECH); Richmond R., Conolly, 9.1904 (TECH); Richmond R. Heads, Henderson, (NSW 22871); Wardell, Ffrench, 7.1921 (NSW 22883), 10.1921 (NSW 22885); Broadwater, Cheel, 1917 (NSW 22879); Myrtle Creek, Bauerlen, 9.1893 (TECH); Angourie Point, Vickery, 5.1954 (NSW 30271).

OTHER REFERENCES: Benth., Fl. Austr. VI (1873) 237 in part excl. Trop. Austr. specimens (as *F. robusta* var. *microcarpa*); Gordon, Pinetum, ed. 3 (1880) 118 (as *F. columellaris*), and 122 (as *F. moorei*); F. Muell., Census (1882) 109; Moore et Betche, Handb.

Fl. N.S.W. (1893) 377; F. M. Bail., Qld. Flora (1902) 1496; Maiden, Forest Flora (1907) 50 excl. N.Terr. references; Maiden in Ag. Gaz. N.S.W. XVIII (1907) 659; F. M. Bail., Compr. Cat. Qld. Pl. (1909-1913) 510; Domin. in Bibl. Bot. XX (1915) 248; Maiden et Betche, Census (1916) 10; Robertson, Recomm. For. Trees Austr. (1926) 39, 92, 93, 241 (as *Callitris arenosa*); Anderson, Trees of N.S.W. (1932) 120, ed. 2 (1947) 197; Dallimore et Jackson, Handb. Conif., ed. 3 (1948) 208 (as *C. arenosa*); Baird in Phytomorphology III (1953) (as *C. arenosa*).

3. C. hugelii (Carr.) Franco in Anais do Inst. Sup. de Agron. XIX (1952) 12.

TYPIFICATION: *Holotype*: Nouvelle-Hollande (Moreton Bay, Leichhardt, 1845) (P). According to Baker and Smith, Pines of Australia (1910) 120, and Franco, in Anais do Inst. Sup. de Agron. XIX (1952) 12, there is a specimen, identified by Baker as *Callitris glauca,* in the Natural History Museum, Paris, collected at Moreton Bay by Leichhardt in 1845 (Leichhardt left Moreton Bay for Port Essington in 1844) and labelled *C. hugelii* by Spach and Brongniart. I have not been able to trace this specimen but in the absence of information to the contrary I have accepted Baker's identification and Franco's conclusion that this was the specimen on which Carrière's *Frenela hugelii* was based.

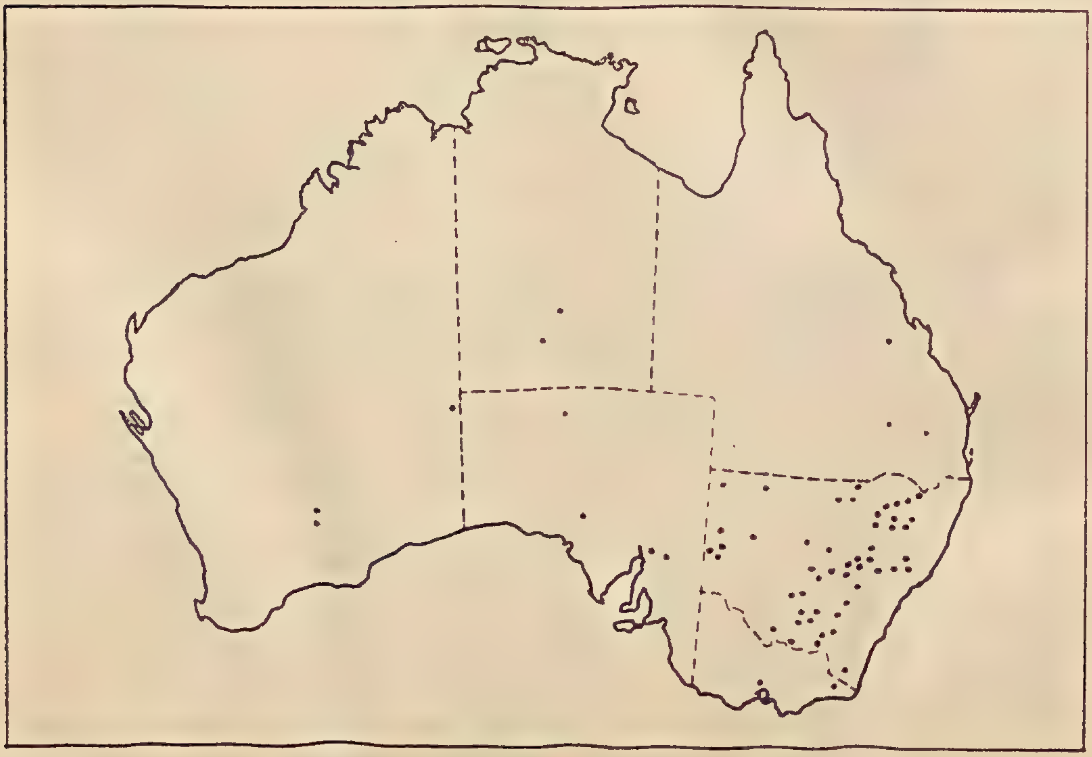
SYNONYMS: *Frenela glauca* Mirb. in Mém. Mus. Par. XIII (1825) 74 nomen. Syntypes: Intérieur de la Nouvelle-Galles du Sud; côte méridionale (golfe Spencer).

Frenela hügelii Knight et Perry, Syn. Conif. (1850) 14 nomen. Holotype: A cultivated plant.

Frenela hugelii Carr., Conif. (1855) 73. Holotype: (See note above).

Callitris glauca R. Br. ex R. T. Baker et H. G. Sm., Pines of Australia (1910) 118 nom. illegit. Lectotype: Mt. Brown, 1802-1805 (K; photograph CANB). Baker and Smith cite a number of specimens some of which are *Callitris preissii.*

Frenela canescens Parl. in A. DC., Prod. XVI, pt. 2 (1868) 448 (Syntypes: in Nova Hollandia austro-occidentali, Roe; Swan R., Drummond 11.1843) and *Frenela gulielmi* Parl., l.c. (Holotype: In Nova Hollandia australi propre Salt-Lake ad Tungketta (in error Tungetta), Princeps Carolus Gulielmus (W; the *Callitris* material in this collection has been destroyed)) probably belong here.



Map 3. Distribution of *C. hugelii.*

ILLUSTRATIONS: F. Muell., Key. Syst. Vic. Pl. (1887-8) f. 3 (as *Callitris verrucosa*); Ag. Gaz. N.S.W. X (1889) 1227 (as *C. verrucosa*); Cambage in Proc. Linn. Soc. N.S.W. XXIX (1904-5) pl. 25 (as *C. robusta*); Maiden in Ag. Gaz. N.S.W. XVIII (1907) 657 (as *C. robusta*); F. M. Bail., Compr. Cat. Qld. Pl. (1909-1913) f. 510 (as *C. robusta*); Baker et Smith, Pines of Australia (1910) 36, 119, 122 (as *C. glauca*); Robertson, Recomm. For. Trees Austr. (1926) f. 31, 32 (as *C. robusta*); Anderson, Trees of N.S.W. (1932) 15 (as *C. robusta*); Blackall, W.A. Wildflowers (1954) 6 (as *C. glauca*).

A tree, occasionally reduced to a shrub, usually glaucous, with ascending, horizontally spreading, occasionally pendulous or fastigiate branches. Leaves usually 0.1-0.3 cm. long, the dorsal surface not keeled. Male cones cylindrical, up to 0.5 cm. long. Female cones solitary on slender fruiting branchlets, rarely remaining on the branches long after maturity, ovoid to depressed-globular, up to 2.5 cm. diameter. Cone-scales 6, thin, often with a very small dorsal point, the alternate scales reduced in size, the larger scales angled into a broad short apex, all usually separating almost to the base of the cone and often spreading widely after maturity. Columella usually slender, occasionally up to 0.7 cm. long. Seeds numerous, chestnut-coloured with 2 wings often 0.4 cm. wide. "White Cypress Pine."

SPECIMENS EXAMINED: See Map 3. *Queensland*: Mackenzie R., Mueller (K; photograph CANB); Roma, Simmonds (NSW 23107); Chinchilla, Darnell-Smith, 4.1926 (NSW 23106); Braemar, Dalby district (TECH).

New South Wales: 40 to 50 miles north-west of Collarenebri, Jackson, 11.1911 (NSW 23166); Arthur's Seat, Stopford, 6.1904 (NSW 23163); Tinapagee, Dalton, 11.1906 (NSW 23112); Mosquito Creek, Mair, 3.1951 (NSW 23175, 23176, 23177); Terry-hie-hie, Julius, 9.1912 (TECH); Warialda, Swain, 7.1911 (NSW 23164); Brewarrina, MacMaster, 3.1910 (NSW 23165); Walgett-Lightning Ridge road, Constable, 5.1951 (NSW 19195); Walgett, Foley, 5.1904 (NSW 23167); Paldrumatta Bore, Cobham Lake, Corbett, 5.1904 (NSW 23108), 5.1901 (NSW 23117); Carbeen Creek, Swain, 10.1911 (NSW 23152); Wee Waa, Taylor, 6.1913 (NSW 23151, 23155, 23156, 23157, 23159); Narrabri, Swain, 7.1912 (TECH); Narrabri district, Lyne, 4.1904 (NSW 23161); Narrabri district, Burrow, 9.1921 (NSW 23148); Cuttabri, Boorman, 8.1913 (NSW 23228); Coghill Creek, Cuttabri, Withers, 9.1920 (NSW 23227); Bohena Creek, Jensen, 8.1911 (NSW 23158); Wongan, 20 miles north of Baradine, Jensen, 8.1911 (NSW 23154); Baradine, Chippendale and Constable, 5.1951 (NSW 23140); Moonbi Range, Blakely, 4.1927 (NSW 23178); Tamworth, Carne, 8.1912 (NSW 23179); Pilliga Scrub, Jensen, 8.1911 (NSW 23153); 1 mile east of Bugaldi, Jensen, 8.1911 (NSW 23170); Gunnedah to Coonabarabran, Forsyth, 10.1899 (NSW 23169); about 12 miles south-west of Gunnedah, Simon, 11.1912 (NSW 23172); about 15 miles south-west of Gunnedah, Swain, 8.1913 (NSW 23175, 23183); Warrumbungles, Swain, 10.1911 (NSW 23182); Warrumbungles near Coonabarabran, de Beuzeville, 12.1915 (NSW 23174, 23235); Liverpool Plains, Cunningham, 5.1825 (K; photograph CANB); Currabubula, Cambage No. 3550, 8.1912 (NSW 23180); north-east slope of Mt. Terrible near Currabubula, Johnson, 10.1951 (NSW 17468); near Tambar Springs, Simon, 2.1912 (NSW 23168, 23171, 23181), 11.1912 (NSW 23173); Summervale, Constable, 5.1951 (NSW 23139); Wilcannia district, Kartzoff, 2.1949 (NSW 23110); Torrowangee, Baker, 5.1904 (NSW 23111); Cobar, Abrahams, 10.1911 (NSW 23144, 23145); Brura Tank, Abrahams, 7.1911 (NSW 23150); Nyngan, Maiden and Boorman, 3.1904 (NSW 23142); Nyngan, 5.1904 (NSW 23143); Darling R., Victorian Expedition in search of Burke and Wills, 1863 (NSW 23109); Bidden State Forest, Biddon, Constable, 4.1952 (NSW 20492); Bidden State Forest, Biddon, 11.1939 (NSW 23200); Gilgandra, Withers, 10.1921 (NSW 23189); Murrurundi, Maiden and Boorman, 5.1902 (NSW 23197); Wongoni, Greatrex, 9.1915 (NSW 23185); Wongoni, Murphy, 11.1918 (NSW 23184); Dunedoo-Merrygoen road, Johnson and Constable, 8.1950 (NSW 16069); Cobbora to Boomley, Johnson and Constable, 8.1950 (NSW 23195); Cobbora, Garden, 10.1949 (NSW 19875, 23192); Broken Hill, Andrews, 12.1917 (NSW 23114); Thakaringa, Marshall, 5.1904 (NSW 23115); 30 miles east of Broken Hill, Andrews, 12.1919 (NSW 23116); Pine Creek, 18 miles south of Broken Hill, Morris, 5.1920 (NSW 23113); Dubbo-Beni road, Constable, 8.1950 (NSW 16197, 16198); Dubbo, Marriott, 5.1904 (NSW 23201, 23190); Dubbo, Boorman, 8.1903 (NSW 23188); Minore, Boorman, 2.1899 (NSW 23187); Glenbawn Dam, east of Aberdeen, Johnson, 11.1954 (NSW 30282); Worondi Creek, Gungal to Mt. Dangar, Johnson, 4.1953 (NSW 23434); Springvale, Wollar East, Johnson and Constable, 8.1950 (NSW 16200); Upper Bylong, Kartzoff, 9.1952 (NSW 23193, 23194), Wellington, Ward, 10.1909 (TECH); Wellington, Oxenford, 8.1948 (NSW 23186); Tomingley to Peak Hill, Maiden, 9.1898 (NSW 23196); Strahorn State Forest, south-east of Mungery, Constable, 9.1951 (NSW 17567); Mt. Hope, Boorman, 5.1906 (NSW 23141); Harvey Ranges, Boorman, 11.1905 (NSW 23203); Blow

Clear State Forest, Walker, 6.1918 (NSW 23202); Murda State Forest, 6 miles north of Condobolin, Fawcett, 9.1921 (NSW 23198); Condobolin to Mt. Tilga, Johnson, 9.1946 (NSW 23149); Roto, Kartzoff, 2.1949 (NSW 23147); Condobolin, Fawcett, 10.1921 (NSW 23212); Bogan Gate to Condobolin, Maiden, 8.1897 (NSW 23209); Bogan Gate, Ising, 4.1924 (NSW 23211); Parkes district, Holdsworth, 4.1904 (NSW 23191); Parkes, Cheel, 8.1926 (NSW 23199); Woolyeo Station, Lake Cudgellico, Home, 3.1890 (TECH), 3.1900 (TECH); Woolyeo Station, Lake Cudgellico, Maiden, 3.1890 (TECH); Lake Cudgellico, Home, 3.1890 (NSW 23138); Cargellico, Boorman, 9.1918 (NSW 23133); Bowan Park, Blakely, 10.1906 (NSW 23214); Forbes, Garling, 10.1912 (NSW 23213); Cargo, Blakely, 10.1906 (NSW 23210); Canowindra district, 7.1930 (NSW 23215); Merriwagga, Gammage, 9.1936 (NSW 23137); Grenfell, Laseron, 3.1909 (TECH); west of Grenfell, Osborne, 4.1904 (NSW 23208, 23206); Weddin Mountain, Grenfell, Osborne, 10.1904 (NSW 23204); Weddin State Forest, Bimbi, de Beuzeville, 6.1932 (NSW 23205); Gunbar, Wilson, 6.1904 (NSW 23138); Griffith, Blakely and Shiress, 7.1928 (NSW 23132); Griffith, Vickery, 10.1949 (NSW 23129); Griffith, Cross, 9.1938 (NSW 23131); Griffith, O'Rourke, 8.1919 (NSW 23128); Ardlethan district, Constable, 5.1948 (NSW 1702); Temora, Dwyer, 6.1913 (NSW 23207); near Combaning, Vickery, 10.1953 (NSW 26406); Leeton, Campbell, 8.1919 (NSW 23128); west of Darlington Point, Johnson, 6.1952 (NSW 23125); Bethungra, Mair, 10.1951 (NSW 17646); Narrandera, Parry, 9.1921 (NSW 23123, 23217); Narrandera, Baker, 10.1892 (TECH), 10.1902 (TECH); near Narrandera, Drover, 12.1948 (NSW 23119); Corobomilla, Drover, 1.1949 (NSW 23122, 23118); south of Narrandera, Drover, 1.1949 (NSW 23121); 7 miles south of Narrandera, Drover, 3.1949 (NSW 23120); Narrandera district, McCormick, 12.1911 (NSW 23124); Downside, near Wagga, Baker, 8.1924 (TECH); Wagga, Baker, 9.1924 (TECH); Wagga Wagga-Tarcutta road 3.1898 (NSW 23216); Wanganella, Officer, 5.1903 (NSW 23134), 10.1917 (NSW 23130, 23136); Yerong Creek road, Henty, McBarron No. 4567, 3.1950 (NSW 23220); Dudal Comer Swamp, Henty, McBarron No. 4488, 2.1950 (NSW 23218); Walbundrie, McBarron No. 4568, 3.1950 (NSW 23219); 5 miles east of Tocumwal, Vickery, 10.1949 (NSW 23126); Barooga, Vickery, 10.1949 (NSW 23127); near Snowy R., south of Paupong, Costin, 11.1948 (NSW 23222); near Snowy R., south of Jimenbuen, Costin, 7.1948 (NSW 23221).

Victoria: Near Deddick, on hillsides near the Snowy R., Waters, 10.1948 (NSW 23103); Bacchus Marsh, Hardy, 1.1923 (NSW 23104).

South Australia: Arcoeillinna, Helms, 5.1891 (NSW 23095, 23096, 23097; TECH); Tarcoola, Mellor, 6.1912 (NSW 23093); Mt. Brown Forest Reserve, Gill, 4.1904 (NSW 23092); Mt. Brown, Brown No. 3108, 1802-1805 (K; photograph CANB); Nakara Forest, Gill, 3.1904 (NSW 23090).

Western Australia: Near Cavenagh Ranges, Helms, 7.1891 (NSW 23087); Kanowna, Fitzgerald, 9.1904 (NSW 23102); near lakes about 8 miles south of Boulder, per Forests Department, 1953 (NSW 26758).

Northern Territory: South of Aileron, Garden, 7.1954 (NSW 31257); Buxstone Ranges, also Macdonnell Ranges, Allen No. 574, 7.1922 (NSW 23094).

Other References: Parl. in A. DC., Prod., XVI, pt. 2 (1868) 451 incl. *Callitris preissii* (as *Frenela robusta*); Benth., Fl. Austr. VI (1873) 236 incl. *Callitris intratropica, C. columellaris, C. preissii* (as *Frenela robusta*); F. Muell., Census (1882) 109 incl. *Callitris preissii, C. intratropica* (as *C. verrucosa*); F. Muell., Key Syst. Vic. Pl. (1887-8) 402 at least for the most part (as *C. verrucosa*); Moore et Betche, Handb. Fl. N.S.W. (1893) 377 (as *C. verrucosa*); F. M. Bail., Qld. Flora (1902) 1496 (as *C. robusta*); Maiden, Forest Flora (1907) 43 for the most part but incl. *C. preissii* ssp. *preissii* (as *C. robusta*); Maiden in Ag. Gaz. N.S.W. XVIII (1907) 659 (as *C. robusta*); F. M. Bail., Compr. Cat. Qld. Pl. (1909-1913) 510 (as *C. robusta*); Domin in Bibl. Bot. XX (1915) 248 (as *C. robusta*); Maiden et Betche, Census (1916) 10 (as *C. robusta*); Ewart et Davies, Fl. N. Terr. (1917) 19 Hermansburg specimen only (as *C. robusta* var. *microcarpa*); Black, Fl. S.A. (1922) 663 (as *C. glauca*); Ewart, Handb. For. Trees (1925) 44 for the most part (as *C. robusta*); Robertson, Recomm. For. Trees Austr. (1926) 78, 85, 242 (as *C. glauca*); Gardner, Enum. Pl. W.A. (1930) 4 (as *C. glauca*); Ewart, Fl. Vic. (1930) 61 excl. var. (as *C. robusta*); Anderson, Trees of N.S.W. (1932) 14 (as *C. robusta*); Black, Fl. S.A., ed. 2 (1943) 44 (as *C. glauca*); Anderson, Trees of N.S.W., ed. 2 (1947) 14 (as *C. glauca*); Dallimore et Jackson, Handb. Conif. (1948) 210 (as *C. glauca*); Baird in Phytomorphology III (1953) (as *C. glauca*); Blackall, W.A. Wildflowers (1954) 6 (as *C. glauca*).

4. C. preissii Miq. in Lehm., Pl. Preiss. I (1845) 643.

Typification: *Syntypes*: In arenosis insulae Rottnest, Preiss No. 1310; in arenosis prope Rocky Bay et Woodman's point, Preiss No. 1312.

SYNONYMS: *Frenela robusta* A. Cunn. ex Mirb. in Mém. Mus. Par. XIII (1825) 74 nomen. Holotype: Ile Rottnest sur la côte occidentale.

Frenela tuberculata R.Br. ex Mirb. in Mém. Mus. Par. XIII (1825) 74 nomen. Holotype: Côte méridionale.

Frenela verrucosa A. Cunn. ex. Mirb. in Mém. Mus. Par. XIII (1825) 74 nomen. Holotype: Intérieur de la Nouvelle-Galles du Sud.

Frenela propinqua R.Br. ex Mirb. in Mém. Mus. Par. XIII (1825) 74 nomen. Holotype: Ile des Kangourous.

Callitris propinqua R.Br. ex Endl., Syn. Conif. (1847) 38 in synon.

Frenela verrucosa A. Cunn. ex Endl., Syn. Conif. (1847) 37. Holotype: Novae Hollandiae orientalis interioribus.

Frenela robusta A. Cunn. ex Parl. in A. DC., Prod. XVI, pt. 2 (1868) 450 nom. illegit. Lectotype: Rottnest Island, A. Cunningham (dupl. K; photograph CANB). Parlatore cites a number of specimens some of which are *Callitris hugelii.*

Frenela robusta A. Cunn. ex Parl. var. *verrucosa* (A. Cunn. ex Endl.) Benth., Fl. Austr. VI (1873) 237.

Callitris robusta (A. Cunn. ex Parl.) F. M. Bail., Queensland Flora V (1902) 1496 nom. illegit.

Callitris verrucosa (A. Cunn. ex Endl.) F. Muell., Census (1882) 109.

Callitris gracilis R. T. Baker in Proc. Linn. Soc. N.S.W. XXVIII (1903) 839, pl. 45. The specimens cited by Baker, Tal Tal Mountain, and Gowie Range, Bylong, J. Dawson, cannot be found in his collection in the herbarium of the Museum of Applied Arts and Sciences, Sydney. The species should therefore be typified from the plate.

Widdringtonia equisetiformis Masters in Journ. Linn. Soc. XXXVII (1905) 271. Syntypes: Kaffraria, Katbergen Div., Stockenstrom, South Africa, Baur, No. 1164; Tokai, South Africa, cultivated.

Callitris tuberculata R.Br. ex R. T. Baker et H.G. Sm., Pines of Australia (1910) 99. Holotype: Middle Island, Goose (in error York) Island Bay, R. Brown 1802 (BM).

Callitris suissii Preiss ex R. T. Baker et H.G. Sm., Pines of Australia (1910) 89 in synon.

Callitris propinqua R.Br. ex R. T. Baker et H.G. Sm., Pines of Australia (1910) 112. Syntypes: Kangaroo Island, R. Brown 1802 (BM); Schweinfurth (B); Hobart Botanic Gardens (a living tree).

ILLUSTRATIONS: See under subspecies.

A tree or shrub with erect or spreading branches, or a stunted, irregularly branched tree, sometimes several-stemmed, occasionally glaucous. Leaves usually 0.2-0.4 cm. long, the dorsal surface not keeled. Male cones cylindrical, up to 0.5 cm. long. Female cones solitary or several together on stout, often clustered, fruiting branchlets, remaining on the branches long after maturity, ovoid to depressed-globular, up to 3.5 cm. diameter. Cone-scales 6, thick, often tuberculate and occasionally bearing a very small dorsal point, the alternate scales reduced, the smaller tapering towards the apex, the larger angled into a broad apex. Columella usually short and thick. Seeds numerous, dark brown, usually with 2 wings 0.3 cm. or more wide.

Within this species 3 subspecies can be recognised. Each is widely distributed over southern mainland Australia. Although distinct over the major part of their range both divergent forms are separated only arbitrarily from the type form in certain areas. Both tend to hybridise with *C. hugelii.*

OTHER REFERENCES: See under subspecies.

KEY TO THE SUBSPECIES.

1. Cones usually 2.5 cm. or more in diameter.
    2. Cones usually broadly ovoid when immature, shorter than broad after maturity .... ssp. *preissii.*
    *2. Cones usually ovoid when immature, tending to be longer than broad after maturity .... ssp. *murrayensis.*

*1. Cones usually less than 2.5 cm. diameter .... ssp. *verrucosa.*

ssp. preissii

Typification: *Holotype*: As species.

Synonyms: *Frenela robusta* A. Cunn. ex Mirb. in Mém. Mus. Par. XIII (1825) 74 nomen. Holotype: Ile Rottnest sur la côte occidentale.

Frenela tuberculata R.Br. ex Mirb. in Mém. Mus. Par. XIII (1825) 74 nomen. Holotype: Côte méridionale.

Frenela robusta A. Cunn. ex Parl. in A. DC., Prod. XVI, pt. 2 (1868) 450 nom. illegit. Lectotype: Rottnest Island, A. Cunningham (dupl. K; photograph CANB).

Callitris robusta (A. Cunn. ex Parl.) F. M. Bail., Queensland Flora V (1902) 1496 nom. illegit. (Bailey's description and notes apply to *C. hugelii.*)

Callitris gracilis R. T. Baker in Proc. Linn. Soc. N.S.W. XXVIII (1903) 839, pl. 45. Lectotype: Plate 45 (see under synonymy of the species).

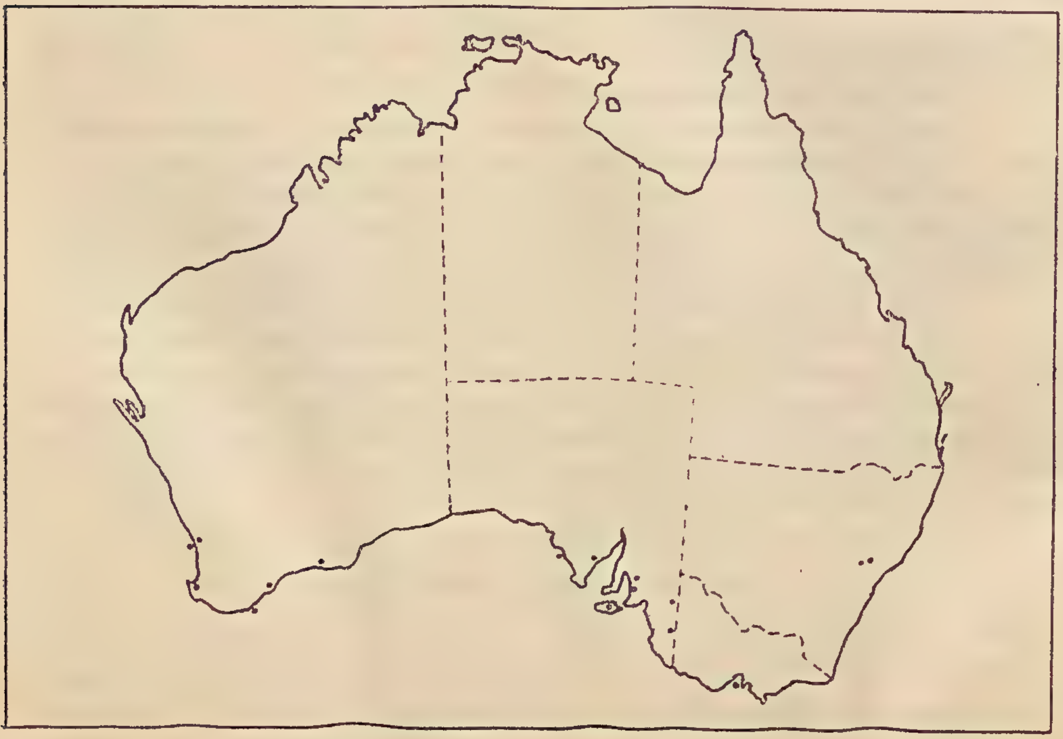
Widdringtonia equisetiformis Masters in Journ. Linn. Soc. XXXVII (1905) 271. Syntypes: Kaffraria, Katbergen Div., Stockenstrom, South Africa, Baur No. 1164; Tokai, South Africa, cultivated.

Callitris tuberculata R.Br. ex R. T. Baker et H.G. Sm., Pines of Australia (1910) 99. Holotype: Middle Island, Goose (in error York) Island Bay, R. Brown 1802 (BM).

Callitris suissii Preiss ex. R. T. Baker et H. G. Sm., Pines of Australia (1910) 89 in synon. probably belongs here.

Illustrations: Baker in Proc. Linn. Soc. N.S.W. XXVIII (1903) pl. 45 (as *Callitris gracilis*); Baker et Smith, Pines of Australia (1910) 36, 88 (as *C. robusta*), and 36, 182, 184, 186 (as *C. gracilis*); Baird in Phytomorphology III (1953) f. 1, 2, 6-11, 20 (as *C. robusta*); Blackall, W.A. Wildflowers (1954) 6 (as *C. robusta*).

Usually a tree with erect or spreading branches, but, on sea coasts, often stunted to a low shrub. Female cones globular or broadly ovoid, often slightly glaucous at the base when young, depressed-globular, often much shorter than broad, when mature often reaching 3 cm. in diameter, the tubercles large, often 0.3 cm. diameter, but frequently scattered or absent. "Rottnest Island Pine."



Map 4. Distribution of *C. preissii* ssp. *preissii.*

Specimens Examined: See Map 4. *New South Wales*: Cox's Gap, Kerrabee, Johnson, 4.1953 (NSW 23435); Junction of Honeysuckle and Murrumbo Creeks, Johnson, 4.1953 (NSW 23437); Gowie Range, near Upper Bylong, King, 6.1903 (NSW 22813); Tal Tal Mountain, Johnson, 10.1951 (NSW 17461); Tal Tal Mountain, King, 2.1905 (NSW 22814); Rylstone, Baker, 1.1904 (TECH).

Victoria: Port Phillip Heads, Backer (NSW 22790; MEL); Quarantine Grounds, Port Phillip (NSW 22789).

South Australia: South Australia, Black, 2.1904 (NSW 23321); Arno Bay, Mellor, 7.1911 (NSW 23313); Flinders Island, Osborn, 1.1924 (NSW 23325); Sandy Creek, near Gawler, Boomsma, 10.1949 (NSW 23326); Sandy Creek, near Gawler, Gill, 3.1904 (NSW 23328); Waterfall Gully, Black, 3.1913 (NSW 23331); Parilla Forest Reserve, Gill, 8.1909 (NSW 23317); Kangaroo Island, Benham, 6.1904 (NSW 23307); Kangaroo Island, Waterhouse, (NSW 23318); Stokes Bay, Kangaroo Island, Ashby No. 1482, 10.1905 (NSW 22779); Kingscote, Kangaroo Island, Thorpe, 6.1904 (NSW 23305); Brownlow, Kangaroo Island, Gill, 6.1907 (NSW 23322); Bangham Forest Reserve, Gill, 1.1914 (NSW 23327).

Western Australia: Western Australia, 7.1903 (TECH); Perth, Cleland (NSW 23284); near Karrakatta, Fitzgerald, 8.1900 (NSW 23282); Claremont, Gardner, 12.1925 (NSW 23271); Claremont, Fitzgerald, 6.1900 (NSW 23275); Rottnest Island, per Forest Department, 7.1913 (NSW 23277); Rottnest Island, Stoate, 1950 (NSW 23274); Rottnest Island, Cunningham No. 317, 1822 (K; photograph CANB); Busselton, Maiden, 10.1909 (NSW 23278); Foot of Wireless Hill, Esperance, Brockway, 1950 (NSW 23283); Coast at Bremer Bay, Wellstead, 5.1903 (NSW 23280), 2.1921 (NSW 23281); Bald Island, herb. Oldfield (K; photograph CANB); Bald Island, Oldfield (NSW 23273), No. 881 (NSW 23279); Bald Island (NSW 23272).

Other References: Endl., Syn. Conif. (1847) 37 (as *Frenela robusta*); Benth., Fl. Austr. VI (1873) 236 incl. *Callitris hugelii, C. intratropica, C. columellaris, C. preissii* ssp. *verrucosa* and perhaps ssp. *murrayensis* (as *Frenela robusta*); Gordon, Pinetum, ed. 3 (1880) 123 excl. some synon. (as *F. robusta*), and 125 (as *F. tuberculata*); F. Muell., Census (1882) 109 incl. *Callitris hugelii, C. intratropica C. preissii* sspp. *murrayensis and verrucosa* (as *C. verrucosa*); Masters in Journ. Linn. Soc. XXXVII (1906) 332 (as *C. robusta*); Maiden, Forest Flora (1907) 40 in part but incl. ssp. *verrucosa* (as *C. verrucosa*), and 54 in part incl. ssp. *murrayensis* (as *C. propinqua*); Baker et Smith, Pines of Australia (1910) 181 (as *C. gracilis*), 89 (as *C. robusta*), and 112 in part incl. ssp. *murrayensis* (as *C. propinqua*); Robertson, Recomm. For. Trees Austr. (1926) 243 (as *C. gracilis*), 124, 244 (as *C. robusta*), and 245 (as *C. tuberculata*); Gardner, Enum. Pl. W.A. (1930) 4 (as *C. robusta*); Black, Fl. S.A., ed. 2 (1943) 44 included in spp. *murrayensis* (as *C. propinqua*); Dallimore et Jackson, Handb. Conif., ed. 3 (1948) 210 (as *C. gracilis*), and 215 for the most part but obviously confused with *C. hugelii* (as *C. robusta*), 216 (as *C. tuberculata*); Franco in Anais do Inst. Sup. Agron. XIX (1952) 15; Baird in Phytomorphology III (1953) (as *C. robusta*); Blackall, W.A. Wildflowers (1954) 6 (as *C. robusta*).

ssp. **murrayensis** ssp. nov.

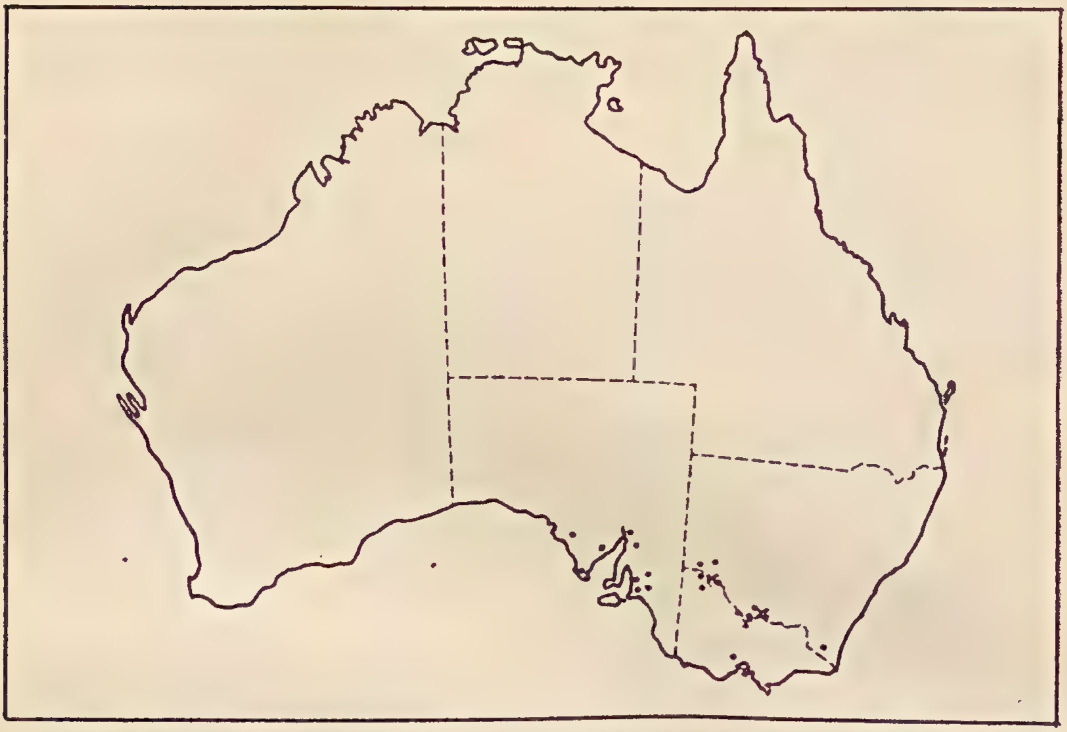
Typification: *Holotype*: Wentworth, J. Bear, 5.1904 (NSW 23293).

Synonyms: *Callitris propinqua* R.Br. ex R. T. Baker et H.G. Sm., Pines of Australia (1910) 112. (Syntypes: Kangaroo Island, R. Brown, 1802 (BM); Schweinfurth (B); Hobart Botanic Gardens (a living tree)) may belong to this subspecies but as further study of the distribution of the subspecies *preissii* and *murrayensis* in South Australia is necessary I prefer to describe this taxon as a new subspecies based on material from Wentworth, an area from which ssp. *preissii* is absent.

Illustrations: Baker et Smith, Pines of Australia (1910) 36, 111 (as *C. propinqua*); Ewart, Handb. For. Trees (1925) pl. 6 (as *C. robusta*) is probably this plant; Black Fl. S.A., ed. 2 (1943) f.33.

Arbor ramis patentibus. Strobili feminei ovoidei, immaturi ad basin glauci, maturi fere globulares sed saepe aliquanto quam diametrum longiores, plerumque 2.5 cm. sed frequenter usque ad 3 cm. diametro, tuberculis 0 vel paucis.

A tree with spreading branches. Female cones ovoid, glaucous at the base when young, almost globular but often tending to be longer than broad when mature, usually 2.5 cm. but frequently reaching 3 cm. in diameter, the tubercles absent or few. "Slender Pine."



Map 5. Distribution of *C. preissii* ssp. *murrayensis*. (x = *C. hugelii* × *C. preissii* ssp. *murrayensis*).

Specimens Examined: See Map 5. *New South Wales*: Pooncarie, Light, 3.1921 (NSW 23292); Wentworth, Bear, 5.1904 (NSW 23293); Euston-Mildura road, Withers, 2.1951 (NSW 23290); between Balranald and Euston, Vickery, 10.1949 (NSW 23291); Deniliquin, Wentworth, 11.1916 (NSW 23285); Barham, Parry, 9.1921 (NSW 23296); Cornalla Station, Kilgour, 6.1916 (NSW 23288); Gulpa Island State Forest, Wentworth, 8.1921 (NSW 23287); near Gulpa sawmill, Whaite No. 1424, 5.1953 (NSW 26783); Mathoura, de Beuzeville, 10.1947 (NSW 23286); Moama, Watson, 7.1906 (NSW 23297); Quiedong, 11.1901 (NSW 23289). The specimen Matong State Forest, Curtin, 10.1954 (NSW 30269) probably belongs to this subspecies.

Victoria: Mildura, Borrett, 5.1904 (NSW 23304); Mildura, Baird, 8.1948 (NSW 23303); Ouyen, Williamson, 9.1913 (TECH); The Oaks, 2 miles east of Lethbridge, Zimmer, 7.1924 (NSW 23302).

South Australia: Mt. Brown Forest Reserve, Gill, 4.1904 (NSW 23314); Minnipa, Spafford, 8.1921 (NSW 23315); Peterborough, Dwyer, 6.1924 (NSW 23316); Franklin Harbour, McKechnie, 2.1872 (NSW 23319); 40 miles north of Adelaide, Benham, 5.1904 (NSW 23312); near Kapunda, Gill, 6.1904 (NSW 23306); Port Lincoln to Coffin's Bay, Maiden, 1.1907 (NSW 23320); Port Lincoln, Boomsma, 10.1949 (NSW 23323); Athelstone, Burton, 5.1920 (NSW 23330); Mt. Lofty, Koch No. 285, 9.1902 (NSW 23309); Murray Bridge, Maiden, 1.1907 (NSW 23324); Tailem Bend, per Bednall, 10.1949 (NSW 23329).

Other References: F. Muell., Census (1882) 109 incl. *Callitris hugelii*, *C. intratropica*, *C. preissii* sspp. *preissii* and *verrucosa* (as *C. verrucosa*); Maiden, Forest Flora (1907) 54 incl. ssp. *preissii* (as *C. propinqua*); Maiden in Ag. Gaz. N.S.W. XVIII (1907) 659 (as *C. propinqua*); Baker et Smith, Pines of Australia (1910) 112 incl. ssp. *preissii* (as *C. propinqua*); Maiden et Betche, Census (1916) 10 (as *C. propinqua*); Black, Fl. S.A. (1922) 44 for the most part but incl. ssp. *preissii* (as *C. robusta*), and 663 for the most part but incl. ssp. *preissii* (as *C. propinqua*); Robertson, Recomm. For. Trees Austr. (1926) 244 (as *C. propinqua*, perhaps a green form of *C. glauca*); Ewart, Fl. Vic. (1930) 61 (as *C. propinqua*), his *C. gracilis* p. 63 excl. N.S.W. specimens is probably this plant; Anderson, Trees of N.S.W. (1932) 15 (as *C. propinqua*); Black, Fl. S.A., ed. 2 (1943) 44 for the most part but incl. ssp. *preissii* (as *C. propinqua*); Anderson, Trees of N.S.W., ed. 2 (1947) 15 (as *C. propinqua*); Dallimore et Jackson, Handb. Conif., ed. 3 (1948) 215 for the most part excl. synon. (as *C. propinqua*).

C. hugelii × C. preissii ssp. **murrayensis**

Specimens Examined: See Map 5. *New South Wales*: Between Euston and Gol Gol, Vickery 10.1949 (NSW 23294); 15 miles west of Tocumwal, Vickery 8.1946 (NSW 23295).

ssp. **verrucosa** (A. Cunn. ex Endl.) comb. et stat. nov.

Typification: *Holotype*: Novae Hollandiae orientalis interioribus. The specimen Euryalean scrub, Lachlan R., New South Wales, A. Cunningham 372/May 1817 (K; photograph CANB) is probably part of the material on which Endlicher's species is based.

Synonyms: *Frenela verrucosa* A. Cunn. ex Mirb. in Mém. Mus. Par. XIII (1825) 74 nomen. Holotype: Intérieur de la Nouvelle-Galles du Sud.

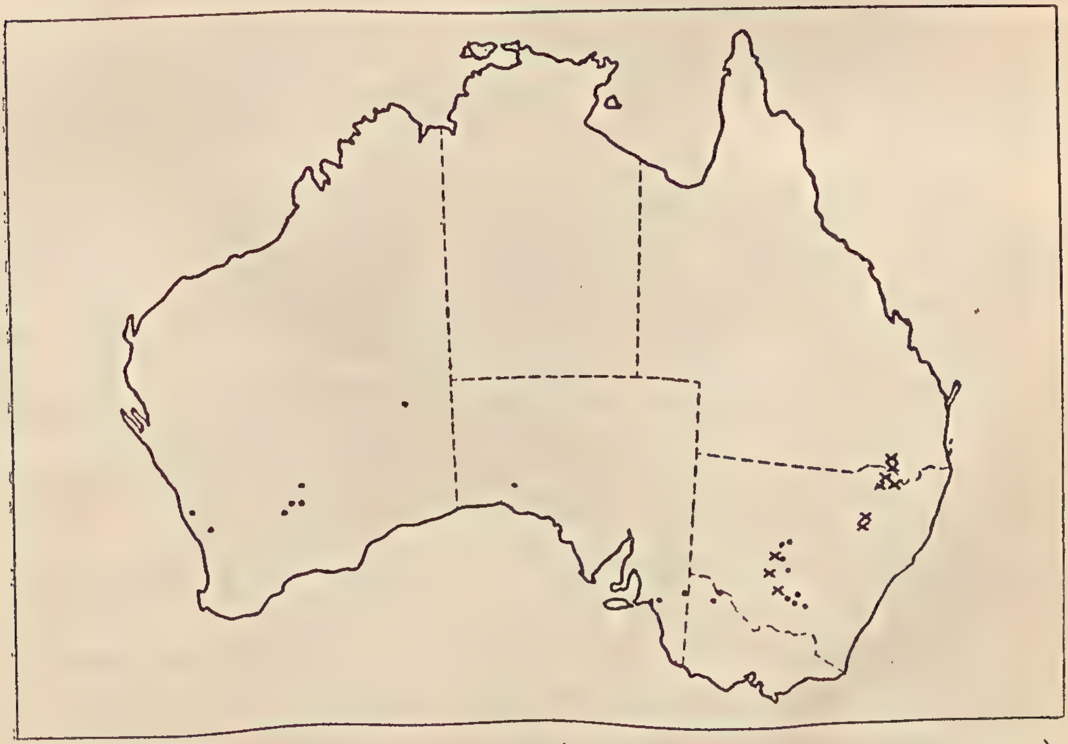
Frenela verrucosa A. Cunn. ex Endl., Syn. Conif. (1847) 37. Holotype: Novae Hollandiae orientalis interioribus.

Frenela robusta A. Cunn. ex Mirb. var. *verrucosa* (A. Cunn. ex Endl.) Benth., Fl. Austr. VI (1873) 237.

Callitris verrucosa (A Cunn. ex Endl.) F. Muell., Census (1882) 109 (Mueller includes other species in his interpretation).

Illustrations: Maiden, Forest Flora (1907) pl. 46 (as *Callitris verrucosa*); Baker et Smith, Pines of Australia (1910) 36, 100 (as *C. verrucosa*); Black, Fl. S.A., ed. 2 (1943) f. 36 (as *C. verrucosa*); Blackall, W.A. Wildflowers (1954) 6 (as *C. verrucosa*).

A stunted or several-stemmed tree or shrub. Female cones broadly ovoid to depressed-globular, usually less than 2.5 cm. in diameter, the tubercles usually dense and small, 0.1-0.2 cm. diameter, but occasionally more scattered and larger. "Mallee Pine."



Map 6. Distribution of *C. preissii* ssp. *verrucosa*. (x = *C. hugelii* × *C. preissii* ssp. *verrucosa.*)

Specimens Examined: See Map 6. *New South Wales*: Nymagee, Boorman, 11.1903 (NSW 23251); Shuttleton, Bauerlen, 11.1903, 9.1903 (TECH); Mt. Hope Road, Cambage, 8.1899 (TECH); Mt. Hope, Boorman, 5.1906 (NSW 23249); Mt. Hope, Moore, 6.1904 (NSW 23248); Woolyeo Station, Lake Cudgellico, Home, 3.1890 (TECH); north of Yenda, Campbell, 3.1918 (NSW 23241); Barellan, Cheel, 4.1925 (NSW 23245); Kamarah, Dwyer, 11.1923 (NSW 23239); Narrandera, McCormick, 1.1912 (NSW 23252); Coolamon, Benton, 3.1900 (TECH); west of Euston, Vickery, 10.1949 (NSW 23246).

Victoria: Murray (NSW 23242); Ouyen, Williamson, 9.1913 (TECH); Nandaly, Watts, 9.1917 (NSW 23253).

South Australia: sandhills east of Ooldea, Deane, 6.1909 (NSW 23085); Pinnaroo district, Gill, 10.1907 (NSW 23254); 9 miles south-east of Tailem Bend, Finlayson, 3.1920 (NSW 23256).

Western Australia: about 70 miles south-west of Mt. Squires, Helms, 9.1891 (NSW 23262); Comet Vale, Maiden, 9.1909 (NSW 23260); Comet Vale, Jutson, 12.1916 (NSW 23263), 8.1917 (NSW 23259); Moora, Cleland, 10.1908 (NSW 23332); Coolgardie district, per Forest Department, 8.1913 (NSW 23333); Coolgardie Goldfields, Pritzel No. 848, 10.1901 (NSW 23258); Boorabbin, Morrison, 1.1906 (TECH); Sandplain near Spargoville, per Forests Department, 1953 (NSW 26759); about 80 miles east of Southern Cross, per Stoat, 1949 (NSW 23257); Tammin, Maiden, 10.1909 (NSW 23261).

Other References: Parl. in A. DC., Prod. XVI, pt. 2 (1868) 448 (as *Frenela verrucosa*); Gordon, Pinetum ed. 3 (1880) 125 in part (as *F. verrucosa*); Maiden, Forest Flora (1907) 40 for the most part but incl. ssp. *preissii* (as *Callitris verrucosa*); Maiden in Ag. Gaz. N.S.W. XVIII (1907) 659 (as *C. verrucosa*); Baker et Smith, Pines of Australia (1910) 101 (as *C. verrucosa*); Maiden et Betche, Census (1916) 10 (as *C. verrucosa*); Black, Fl. SA (1922) 45 (as *C. verrucosa*); Ewart, Handb. For. Trees (1925) 48 (as *C. robusta* var. *verrucosa*); Robertson, Recomm. For. Trees Austr. (1926) 80, 245 (as *C. verrucosa*); Gardner, Enum. Pl. W.A. (1930) 4 (as *C. verrucosa*); Ewart, Fl. Vic. (1930) 60 (as *C. verrucosa*); Anderson, Trees of N.S.W. (1932) 15 (as *C. verrucosa*); Black, Fl. S.A., ed. 2 (1943) 45 (as *C. verrucosa*); Anderson, Trees of N.S.W., ed. 2 (1947) 15 (as *C. verrucosa*); Dallimore et Jackson, Handb. Conif., ed. 3 (1948) 217 (as *C. verrucosa*); Baird in Phytomorphology III (1953) (as *C. verrucosa*); Blackall, W.A. Wildflowers (1954) 6 (as *C. verrucosa*).

C. hugelii × C. preissii ssp. **verrucosa**

Illustrations: F. M. Bail., Compr. Cat. Qld. Pl. (1909-1913) f. 512 (as *C. verrucosa*).

Specimens Examined: See Map 6. *Queensland*: State Forest Reserve 122, Inglewood, Smith, 10.1938 (NSW 23105); Yelarbon to Whetstone, Johnson and Constable, 11.1954 (NSW 30262).

New South Wales: Ticketty Well, Swain, 7.1911 (NSW 23224); Arthur's Seat, Stopford, 6.1904 (NSW 23160); Warialda, Rupp, 7.1905 (NSW 23236); Warialda, de Beuzeville, 9.1912 (NSW 23234); Bullalla, Warialda district, de Beuzeville, 11.1912 (NSW 23238); Terry-hie-hie, Julius, 9.1912 (TECH); Mission State Forest, Narrabri district, Brennan, 3.1949 (NSW 23229) 4.1948 (NSW 23223); Bohena Creek, Burrow, 7.1921 (NSW 23231); Bohena Creek, Swain, 7.1912 (TECH); Bohena, Swain, 10.1911 (NSW 23230); Mt. Hope, Boorman, 5.1906 (NSW 23247, 23250); Merriwagga, Gammage, 8.1936 (NSW 23298); Mt. Binya State Forest, Withers, 8.1950 (NSW 23300, 23243, 23244).

Western Australia: Comet Vale, Jutson, 12.1916 (NSW 23334); south-west of Queen Victoria's Spring, Helms, 9.1891 (NSW 23086); Boorabin, Helms, 11.1891 (NSW 23088).

The distribution of this hybrid population indicates that *C. preissii* ssp. *verrucosa* was once less restricted in range in the eastern states. It now survives only in the hybrid form in northern New South Wales and Queensland.

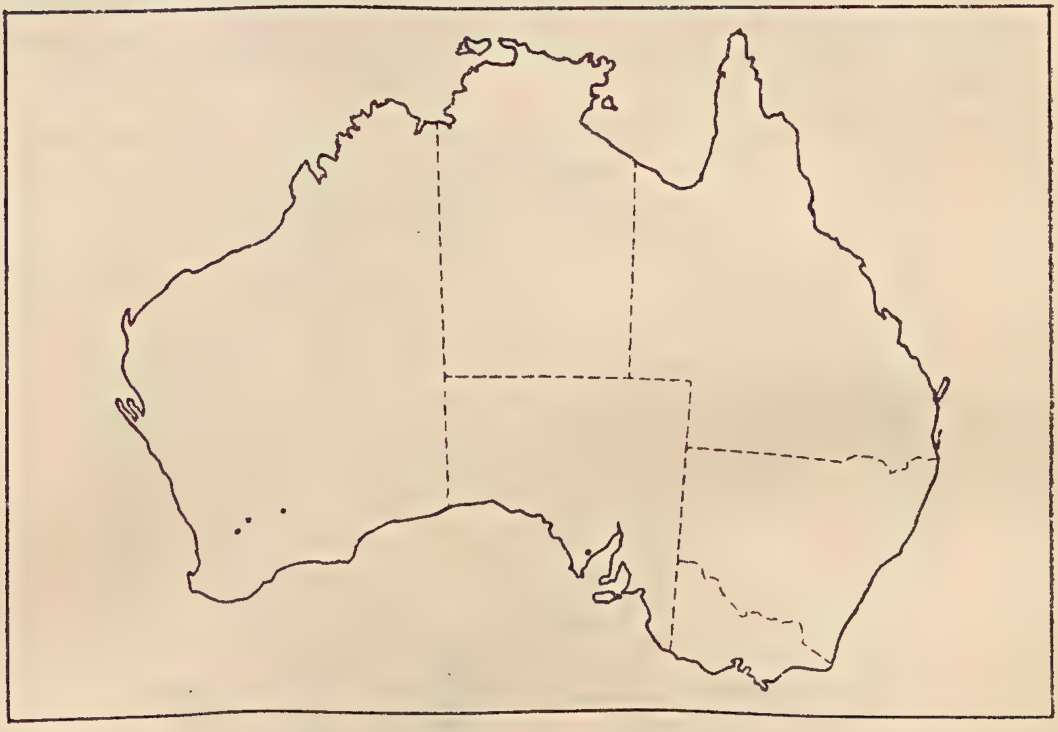
Other References: F. M. Bail., Qld. Flora (1902) 1496 (as *Callitris verrucosa*); F. M. Bail., Compr. Cat. Qld. Pl. (1909-1913) 510 (as *C. verrucosa*).

5. **C. morrisonii** R. T. Baker in Proc. Linn. Soc. N.S.W. XXXI, 1906 (1907) 717.

Typification: *Lectotype*: Kellerberrin (in error Killerberrin), W.A., F. A. Vachell per Dr. A. Morrison, 7.1903 (NSW 29887). Baker cites other specimens one of which, Murchison R., W.A., Oldfield, is not this species.

Illustrations: Baker in Proc. Linn. Soc. N.S.W. XXXI (1906) pl. 67; Baker et Smith, Pines of Australia (1910) 36, 260; Black, Fl. S.A., ed. 2 (1943) f. 34 (as *C. drummondii*); Blackall, W.A. Wildflowers (1954) 6.

A small light green or glaucous tree or shrub. Leaves usually less than 0.4 cm. long, very short and crowded on the smaller branchlets, the dorsal surface not keeled. Male cones not seen. Female cones solitary or several together on stout, often clustered, fruiting branchlets which broaden at the base of the cone, remaining on the branches long after maturity, broadly ovoid to depressed-globular, up to 2 cm. diameter but usually smaller, the surface dull, somewhat metallic or shining as if lacquered. Cone-scales 6, very thick, the alternate scales reduced in size, the larger scales with a broad, often rounded, apex, all with a broad dorsal thickening near the apex or a small dorsal point. Columella variable, usually short and broad. Seeds numerous, almost black, with 2 wings usually 0.2 cm. wide.



Map 7. Distribution of *C. morrisonii.*

Specimens Examined: See Map 7. *South Australia*: Arno Bay, Eyre's Peninsula, Mellor, 7.1911 (NSW 22778); Arno Bay, Black, 3.1913 (NSW 22780).

Western Australia: Western Australia, Drummond No. 186 (NSW 22777); Western Australia, per Forests Department, 1953 (NSW 28746); near Carrabin, per T. N. Stoate, 1950 (NSW 22772); Merredin, Koch No. 2965, 11.1923 (NSW 22776); Kellerberrin, Vachell, 12.1903 (NSW 22774), 7.1903 (NSW 29887); Kellerberrin, Raily (TECH).

Other References: Baker et Smith, Pines of Australia (1910) 259 at least for the most part; Black, Fl. S.A. (1922) 45 (as *Callitris drummondii*); Robertson, Recomm. For. Trees. Austr. (1926) 128, 143; Gardner, Enum. Pl. W.A. (1930) 4; Black, Fl. S.A., ed. 2 (1943) 45 (as *C. drummondii*); Dallimore et Jackson, Handb. Conif., ed. 3 (1948) 212; Baird in Phytomorphology III (1953); Blackall, W.A. Wildflowers (1954) 6.

6. C. roei (Endl.) F. Muell., Census (1882) 109.

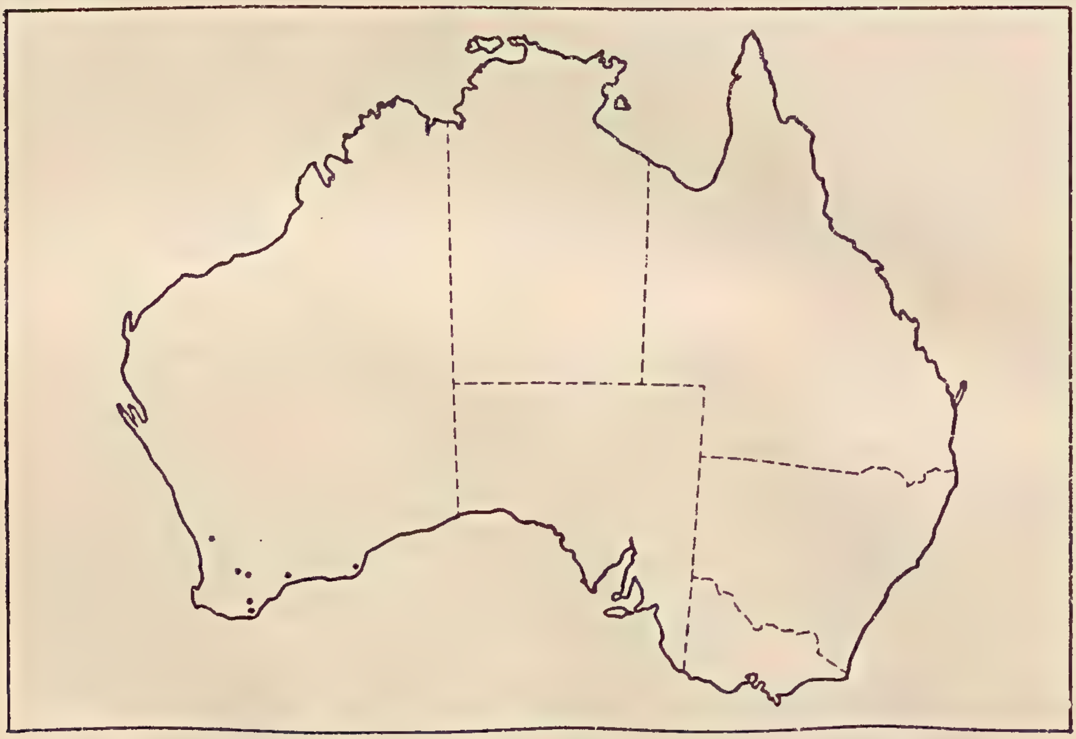
Typification: *Holotype*: In Novae Hollandiae austro-occidentalis interioribus.

Synonyms: *Frenela roei* Endl., Syn. Conif. (1847) 36. Holotype: In Novae Hollandiae austro-occidentalis interioribus.

Frenela subcordata Parl., Enum. Sem. Hort. Flor. (1863) 24. Holotype: In Nova Hollandia austro-occidentali prope King George's Sound, Baxter.

Illustrations: Baird in Phytomorphology III (1953) f. 4, 5, 11, 20; Blackall, W.A Wildflowers (1954) 6.

A small, usually glaucous, tree with numerous flexuose spreading branches. Leaves usually 0.3-0.5 cm. long, the dorsal surface acutely keeled. Mature male cones not seen. Female cones solitary or several together on stout, often clustered, fruiting branchlets, remaining on the branches long after maturity, depressed-globular, up to 2 cm. diameter. Cone-scales 6, very thick, each with a large, acute, conical dorsal protuberance near the apex and frequently with a broad dorsal furrow below. Alternate scales reduced in size, the smaller scales tapering towards the apex, the larger almost parallel-sided and abruptly angled into a short, broad apex. Columella usually 0.4 cm. long and 0.4 cm. broad, 3-angled at the apex. Perfect seeds few, usually 6, chestnut-coloured, with 2 unequal wings, the larger usually 0.4 cm. wide.



Map 8. Distribution of *C. roei.*

SPECIMENS EXAMINED: See Map 8. *Western Australia*: Western Australia, Drummond No. 235 (NSW 22783); about 10 miles west of Bolgart, per Forests Department, 1953 (NSW 28637); Birdwhistle Reserve, Wickepin, per Conservator of Forests, 8.1950 (NSW 22788); Harrismith, Gardner, W.A. No. 2125, 3.1924 (NSW 22787); Israelite Bay, Brookes, 9.1915 (NSW 22785); Phillip's R. (NSW 22786); near Stirling Range (NSW 22784); King George's Sound, Baxter (K; photograph CANB).

OTHER REFERENCES: Parl. in A. DC., Prod. XVI, pt. 2 (1868) 448 (as *Frenela roei*); Benth., Fl. Austr. VI (1873) 236 (as *F. roei*); F. Muell., Census (1882) 109; Gordon, Pinetum, ed. 3 (1880) 124 (as *F. roei* and *F. subcordata*); Baker et Smith, Pines of Australia (1910) 258; Robertson, Recomm. For. Trees Austr. (1926) 244; Gardner, Enum. Pl. W.A. (1930) 4; Dallimore et Jackson, Handb. Conif., ed. 3 (1948) 215; Baird in Phytomorphology III (1953); Blackall, W.A. Wildflowers (1954) 6.

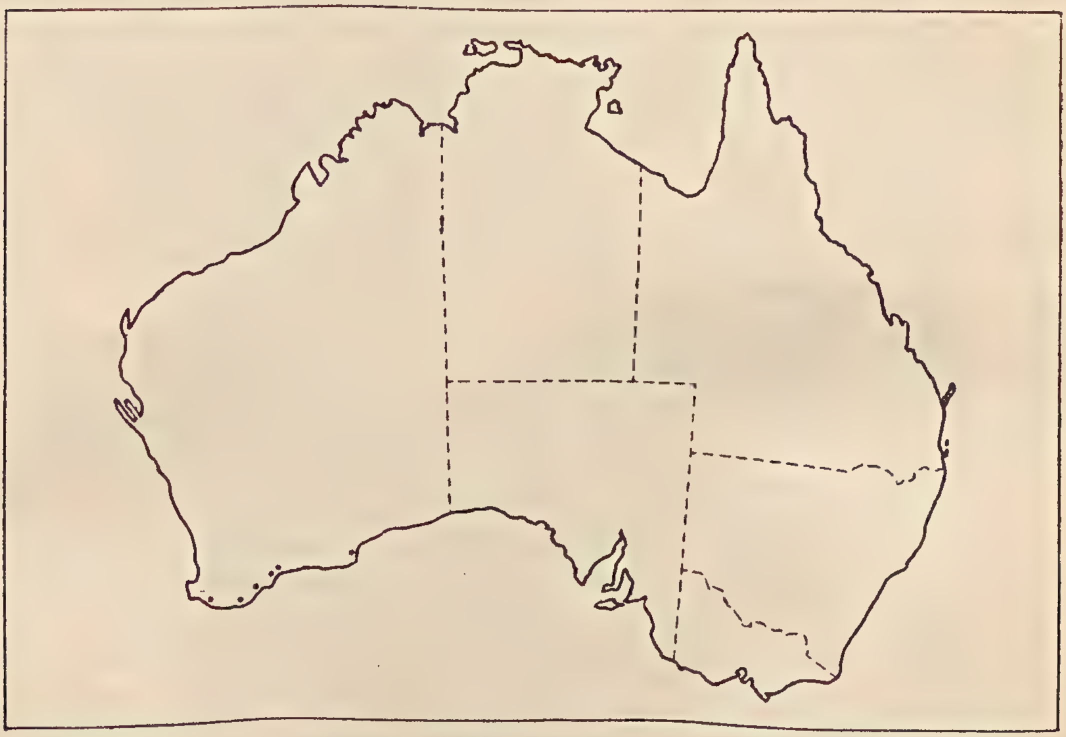
7. **C. drummondii** (Parl.) F. Muell., Census (1882) 109.

TYPIFICATION: *Holotype*: In Nova Hollandia austro-occidentali ad Cygnorum flumen, J. Drummond.

SYNONYMS: *Frenela drummondii* Parl., Enum. Sem. Hort. Flor. (1863) 24. Holotype: In Nova Hollandia austro-occidentali ad Cygnorum flumen, J. Drummond.

ILLUSTRATIONS: Baker et Smith, Pines of Australia (1910) 36, 252; Baird in Phytomorphology III (1953) f. 11; Blackall, W.A. Wildflowers (1954) 6.

A shrub or small tree. Leaves usually 0.3-0.4 cm. long, the dorsal surface acutely keeled. Male cones not seen. Female cones solitary or several together on stout, often clustered, fruiting branchlets which broaden towards the base of the cone, remaining on the branches long after maturity, depressed-globular, usually 1.5 cm. diameter. Cone-scales 6, thick, the dorsal point vestigial or absent, the alternate scales somewhat reduced, the larger scales angled into a broad apex. Columella 0.3 cm. long, 0.3 cm. broad, 3-angled at the apex. Seeds few, usually 6, chestnut-coloured, with 2 unequal wings, the larger usually 0.3 cm. wide.



Map 9. Distribution of *C. drummondii.*

SPECIMENS EXAMINED: See Map 9. *Western Australia*: Western Australia, 6.1903 (TECH); Israelite Bay, Willis, 11.1950 (NSW 27041); Salt R., Gardner R., Fitzgerald R. (NSW 22781); Middle Mt. Barren Ridges, King George's Sound (NSW 22775); Swan R. to Cape Riche, Drummond No. 433 (NSW 22782; K; photograph CANB).

OTHER REFERENCES: Parl. in A. DC., Prod. XVI, pt. 2 (1868) 448 (as *Frenela drummondii*); Benth., Fl. Austr. VI (1873) 236 (as *F. drummondii*); Gordon, Pinetum, ed. 3 (1880) 118 (as *F. drummondii*); F. Muell., Census (1882) 109; Baker et Smith, Pines of Australia (1910) 253; Robertson, Recomm. For. Trees Austr. (1926) 129, 241 excl. S.A. specimens; Gardner, Enum. Pl. W.A. (1930) 4; Dallimore et Jackson, Handb. Conif., ed. 3 (1948) 210; Baird in Phytomorphology III (1953); Blackall, W.A. Wildflowers (1954) 6.

8. C. sulcata (Parl.) Schlecht. in Engl. Jahrb. XXXIX (1907) 16.

TYPIFICATION: *Holotype*: New Caledonia, Moore, Herb. Hook. (K; photograph CANB).

SYNONYMS: *Frenela sulcata* Parl., Enum. Sem. Hort. Flor. (1863) 23. Holotype: New Caledonia, Moore, Herb. Hook. (K; photograph CANB).

Frenela subumbellata Parl. in A. DC., Prod. XVI, pt. 2 (1868) 447. Holotype: New Caledonia, Herb. Hook. (K; photograph CANB).

Frenela balansae Brongn. et Gris. in Bull. Soc. Bot. Fr. XVI (1869) 327. Holotype: New Caledonia, Balansa.

Callitris balansae (Brongn. et Gris.) Schlecht. in Engl. Jahrb. XXXIX (1907) 16.

Callitris subumbellata (Parl.) Schlecht. in Engl. Jahrb. XXXIX (1907) 16.

A tree. Leaves usually 0.4 to 0.6 cm. long, the dorsal surface very prominently, but obtusely, keeled. Male cones ovoid to oblong, up to 0.5 cm. long. Female cones solitary on slender fruiting branchlets, probably not remaining attached long after maturing, ovoid to depressed-globular, often distorted, up to 1.8 cm. in diameter but often smaller. Cone-scales 6, subequal, somewhat elliptical, each with a prominent dorsal point near the apex and often a dorsal furrow below. Columella stout, up to 0.4 cm. long, narrowed at the base, usually 3-angled towards the apex. Seeds not seen.

SPECIMENS EXAMINED: *New Caledonia*: Base of the mountain ranges south-west of New Caledonia, Moore No. 5, 8.1862 (K; photograph CANB); Balansa, No. 182, 1868-1870 (K; photograph CANB), No. 2906, 1868-1870 (K; photograph CANB), No. 2906 b, 1868-1870 (K; photograph CANB); R. Tontouta, Hotchkiss, 3.1954 (NSW 28864).

OTHER REFERENCES: Parl. in A. DC., Prod. XVI, pt. 2 (1868) 446 (as *Frenela sulcata*); Gordon, Pinetum, ed. 3 (1880) 124 (as *F. subumbellata* and *F. sulcata*); Dümmer in Journ. Bot. LII (1914) 239; Compton in Journ. Linn. Soc. XLV (1922) 431; Guillaumin, Fl. New Caled. (1948) 13; Dallimore et Jackson, Handb. Conif., ed. 3 (1948) 216.

9. **C. neocaledonica** Dümmer in Journ. Bot. LII (1914) 239.

TYPIFICATION: *Holotype*: Auf den Bergen am Ngoye, New Caledonia, R. Schlechter No. 15179, 1.12.1902 (K; photograph CANB).

SYNONYMS: *Callitris sulcata* (Parl.) Schlecht. var. *alpina* R. H. Compton in Journ. Linn. Soc. XLV (1922) 432. Holotype: Nekando, New Caledonia, R. H. Compton No. 2026, 1914.

A small, broad-crowned tree. Leaves usually 0.3-0.4 cm. long, the dorsal surface prominently, often almost acutely, keeled. Male cones not seen. Female cones not seen in an undamaged condition, on slender fruiting branchlets, small, apparently consisting of 6 almost equal-sized narrow-elliptical scales 0.8 cm. long. Columella and seeds not seen.

SPECIMENS EXAMINED: *New Caledonia*: Auf den Bergen am Ngoye, Schlechter, No. 15179, 12.1902 (K; photograph CANB; NSW 28865).

OTHER REFERENCES: Guillaumin, Fl. New Caled. (1948) 13; Dallimore et Jackson, Handb. Conif., ed. 3 (1948) 213, 216 (as *Callitris sulcata* var. *alpina*).

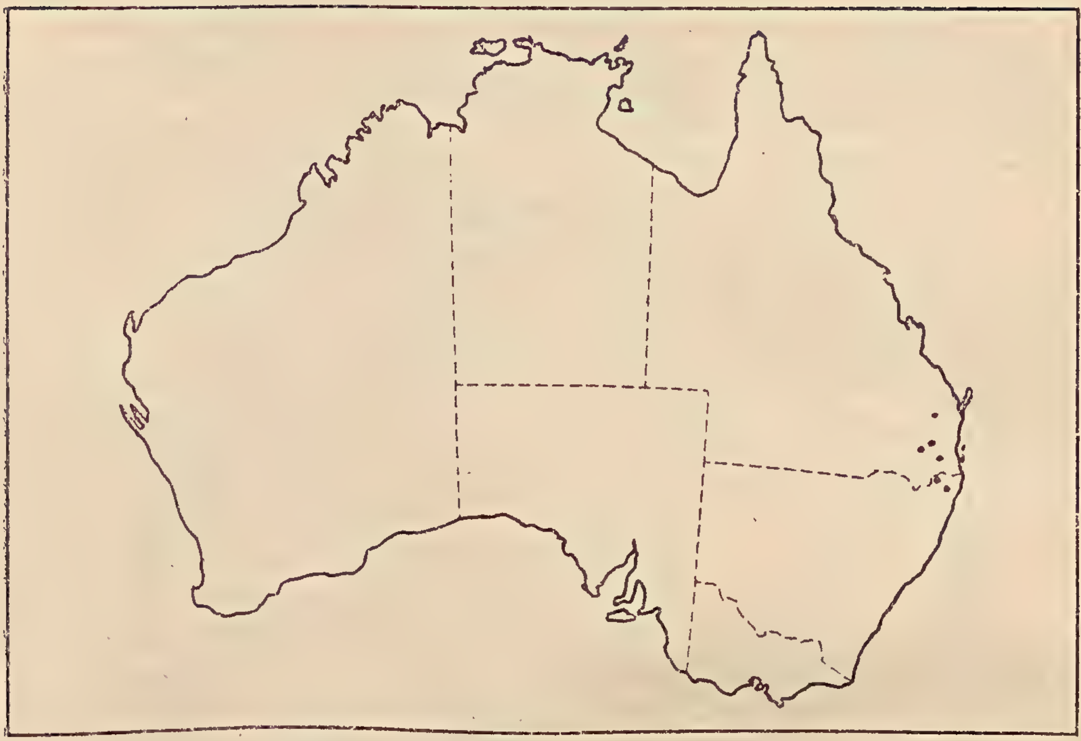
10. **C. baileyi** C. T. White in Proc. Linn. Soc. N.S.W. XLVIII (1923) 449.

TYPIFICATION: *Holotype*: Benarkin, W. D. Francis, E. H. Wilson and F. H. Weatherhead, 5.1921.

ILLUSTRATIONS: C. T. White in Proc. Linn. Soc. N.S.W. XLVIII (1923) pl. 37.

A slender green tree. Leaves 0.2-0.5 cm. long, usually 0.2 cm. on the ultimate branchlets, the dorsal surface prominently, often acutely, keeled. Mature male cones not seen. Female cones solitary on slender fruiting branchlets, probably not remaining attached long after maturity, ovoid to oblong, often distorted, up to 1.3 cm. diameter. Cone-scales 6, thick, each with a prominent dorsal point below the apex and a conspicuous dorsal furrow below, the alternate scales reduced in size, the larger scales usually angled towards the apex. Columella stout, narrowed at the base, slightly angled, 0.3 cm. long. Seeds few, with 2 unequal wings.

SPECIMENS EXAMINED: See Map 10. *Queensland*: Kinbombi, Laseron, 8.1911 (TECH); Benarkin, Francis (NSW 22812); Nutgrove, per Director of Forests (TECH); Rosewood, Harding, 5.1901 (NSW 22811; TECH); Rosewood, Bailey (TECH).



Map 10. Distribution of *C. baileyi.*

New South Wales: Acacia Creek, Dunn, 6.1905 (NSW 22810); Sandilands, near Tabulam, Taylor, 3.1910 (TECH).

OTHER REFERENCES: Robertson, Recomm. For. Trees Austr. (1926) 92, 241.

11. C. macleayana (F. Muell.) F. Muell. in Rep. Burdek. Exped. (1860) 17.

TYPIFICATION: *Holotype*: At Tacking Point of Port Macquarie, W. S. Macleay. No specimen so labelled has as yet been traced.

SYNONYMS: *Leichhardtia macleayana* Shep., Cat. Pl. Cult. Syd. (1851) 15 nomen. Holotype: A plant cultivated in the Sydney gardens.

Octoclinis macleayana F. Muell. in Trans. Phil. Inst. Vic. II (1858) 22. Holotype: At Tacking Point of Port Macquarie, W. S. Macleay.

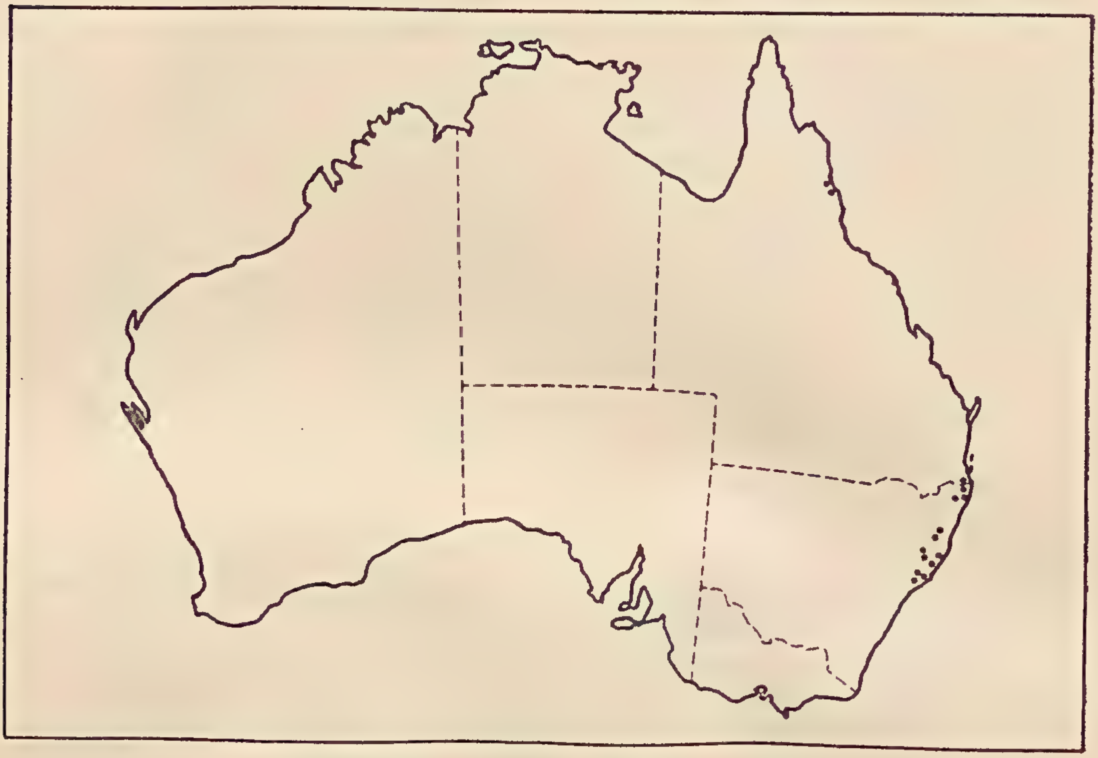
Callitris parlatorei F. Muell. in Seem. Journ. Bot. IV (1866) 267. Holotype: Darlington Range, Queensland, W. Hill (MEL).

Frenela macleayana (F. Muell.) Parl. in A. DC., Prod. XVI, pt. 2 (1868) 446.

Frenela parlatorei (F. Muell.) F. Muell. ex Parl. in A. DC., Prod. XVI, pt. 2 (1868) 447.

ILLUSTRATIONS: F. Muell. in Trans. Phil. Inst. Vic. II (1852) 22 (as *Octoclinis macleayana*); Maiden, Forest Flora (1907) pl. 46; F. M. Bail., Compr. Cat. Qld. Pl. (1909-1913) f. 509; Baker et Smith, Pines of Australia (1910) 36, 279; Domin in Bibl. Bot. XX (1915) f. 60; Baird in Phytomorphology III (1953) f. 11, 20.

A tree with spreading branches and sub-fibrous furrowed bark. Mature leaves usually 0.2-0.3 cm. long, the dorsal surface acutely keeled. Juvenile leaves often remaining even on shoots bearing cones. Male cones oblong, up to 0.8 cm. long. Female cones solitary on thick, often glaucous, fruiting branchlets which broaden towards the base of the cone, remaining on the branches long after maturity, ovoid to conical, acuminate, often distorted, up to 3 cm. diameter. Cone-scales 6 (8 in cones on juvenile branches), thick, each with a small dorsal point near the apex, the alternate scales not reduced in size, all scales tapering towards the apex. Columella very short, 3-lobed or 3-partite, occasionally 4-lobed in cones on juvenile branches. Seeds chestnut-coloured with one long wing. "Stringybark Pine."



Map 11. Distribution of *C. macleayana*.

SPECIMENS EXAMINED: See Map 11. *Queensland*: Kuranda, White No. 1545, 2.1922 (NSW 22859); back of Cairns Forest, Dixon, 8.1899 (NSW 22853); Darlington Range, Hill, 1872 (K; photograph CANB; MEL).

New South Wales: New South Wales, McLeay (K; photograph CANB); Tumbulgum, Bauerlen, 8.1897 (TECH); Alstonville, Pope, 6.1904 (NSW 22867); Mallanganee, Flick, 9.1924 (NSW 22855); Wild Cattle Creek State Forest, Walker, 6.1917 (NSW 22858); Cascades, Cheel, 1.1926 (NSW 22862); Dorrigo, Wilshire, 5.1904 (NSW 22865); Dorrigo Forest Reserve, 10.1896 (NSW 22869); Oxley highway between Yarras and Yarrowitch, Fraser, 4.1952 (NSW 22860); Port Macquarie to Tacking Point, Johnson, 10.1953 (NSW 26211); Port Macquarie, Mueller (K, photograph CANB); Port Macquarie, Laseron, 2.1914 (TECH); Bulga, Welch, 3.1930 (TECH); about 2 miles east of Comboyne Town, Cleland, 9.1918 (NSW 22870); Ellenborough Falls, Maiden and Boorman, 10.1902 (NSW 22857); near Lansdowne, Hardiman, 5.1904 (NSW 22854); 12 miles from Coopernook, Langley, 1.1898 (NSW 22868); the divide between Callaghan's Creek and the Manning R., Lane-Poole, 4.1952 (NSW 22861); Upper Gloucester R., Forbes, 9.1932 (TECH); Craven State Forest, de Beuzeville, 7.1917 (NSW 22864); Coolongolook, Laseron, 9.1907 (TECH); Clarence Town, Ikin, 3.1905 (NSW 22866).

OTHER REFERENCES: Benth., Fl. Austr. VI (1873) 235 (as *Frenela parlatorei* and *F. macleayana*); Gordon, Pinetum, ed. 3 (1880) 121 (as *F. macleayana*); F. Muell., Census (1882) 109, (and as *C. parlatorei*); Moore et Betche, Handb. Fl. N.S.W. (1893) 377, (and as *C. parlatorei*); F. M. Bail., Qld. Flora (1902) 1495; Maiden, Forest Flora (1907) 38; Maiden in Ag. Gaz. N.S.W. XVIII (1907) 659; F. M. Bail., Compr. Cat. Qld. Pl. (1909-1913) 510; Baker et Smith, Pines of Australia (1910) 278; Domin in Bibl. Bot. XX (1915) 247; Maiden et Betche, Census (1916) 10; Robertson, Recomm. For. Trees Austr. (1926) 39, 243; Anderson, Trees of N.S.W. (1932) 120, ed. 2 (1947) 197; Dallimore et Jackson, Handb. Conif., ed. 3 (1948) 212; Baird in Phytomorphology III (1953).

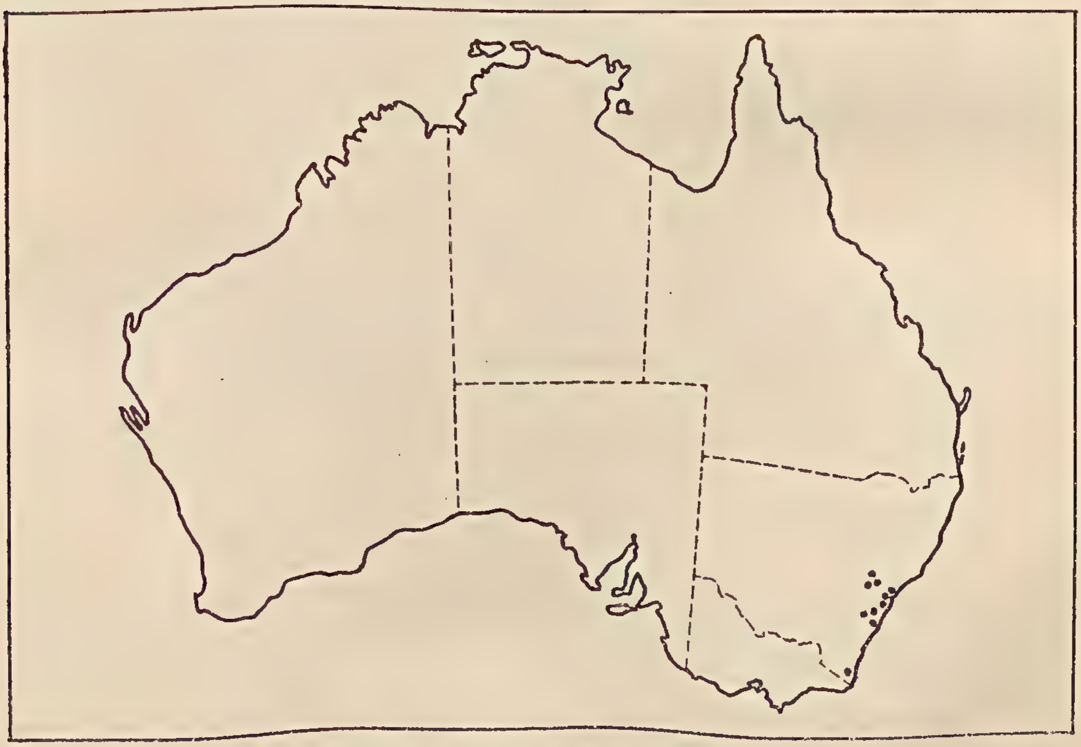
12. C. muelleri (Parl.) F. Muell., Census (1882) 109.

Typification: *Lectotype*: South Head, Thozet (MEL). Parlatore cites several other specimens one of which, Port Phillip Heads, Mrs. Backer, is *C. preissii.*

Synonyms: *Frenela muelleri* Parl. in A. DC., Prod. XVI, pt. 2 (1868) 450. Lectotype: South Head, Thozet (MEL).

Illustrations: Maiden, Forest Flora (1907) pl. 48; Baker et Smith, Pines of Australia (1910) 36, 263, 264; Anderson, Trees of N.S.W., ed. 2 (1947) 129.

A small tree or shrub with fastigiate branches. Mature leaves usually 0.4-1 cm. long, the dorsal surface prominently, but not acutely, keeled. Juvenile leaves occasionally remaining even on branches bearing cones. Male cones ovoid to obovoid, up to 0.3 cm. long. Female cones solitary or several together on fruiting branchlets, remaining on the branches after maturity, usually depressed-globular, up to 3 cm. diameter. Cone-scales 6, thick, each with a small dorsal point near the apex, the alternate scales narrower and usually shorter, the larger scales usually angled, but occasionally tapering, towards the apex. Columella 0.1-0.4 cm. long, 3-lobed or 3-angled. Seeds numerous, dark brown, with 2 wings 0.2-0.4 cm. wide. "Mueller's Cypress Pine."



Map 12. Distribution of *C. muelleri.*

Specimens Examined: See Map 12. *New South Wales*: Sieber, No. 137 (K; photograph CANB); near Newnes, McLeod, 6.1925 (NSW 22828); Clarence to Wolgan, Maiden, 11.1906 (NSW 22827); Mt. Tambo Limb, Constable, 12.1948 (NSW 17199); Du Faur's Rocks, Mt. Wilson, Johnson, 9.1949 (NSW 22829); Mt. Wilson, Maiden, 10.1899 (NSW 22823), 4.1896 (NSW 22831); Mt. Victoria, Baker, 12.1890 (TECH); Mt. Hay, Fletcher (NSW 22826); Blackheath, Vickery, 9.1936 (NSW 22820); Blackheath, Constable, 12.1946 (NSW 17218), 1.1950 (NSW 11127); Wentworth Falls, Schipp, 11.1949 (NSW 32832); Wentworth Falls, Fraser, 8.1927 (NSW 22825); Wentworth Falls, Maiden, 10.1898 (NSW 22822); Wentworth Falls, Johnson, 10.1948 (NSW 22819); King's Tableland, Wentworth Falls, Johnson and Ford, 8.1950 (NSW 22833); King's Tableland, Wentworth Falls, Bauerlen, 4.1899 (TECH; NSW 22835); King's Tableland, Morris, 9.1927 (NSW 22834); King's Tableland, Cheel, 1932

(NSW 22824); Queens Road, Lawson, Laseron, 8.1919 (TECH); Linden, Maiden and Cambage, 11.1904 (NSW 22821); Blue Mountains, Cunningham (K; photograph CANB); Woy Woy, Murphy, 2.1900 (NSW 22842) 4.1900 (NSW 22838); Trig. Hill, Kangaroo Point, Hawkesbury R., Blakely, 8.1925 (NSW 22839); Hawkesbury R., Cleland, 6.1912 (NSW 22844); Cowan, Johnson, 8.1948 (NSW 6492); Kuringai Chase, Bracken, 7.1951 (NSW 22849); Galston Valley, Blakely and Shiress, 5.1919 (NSW 22843); Lane Cove R., Betche, 11.1888 (NSW 22840); Lane Cove R., Port Jackson (TECH); churchyard, North Shore, Mueller (TECH); Spit Road, Manly, Boorman, 1903 (NSW 22837); Clontarf, Cannon, 12.1903, 11.1910 (TECH); Clontarf, Taylor, 10.1907 (TECH); Clontarf, Taylor and Cannon, 8.1907 (TECH); Middle Harbour, Baker, 3.1892 (TECH); Spit, Middle Harbour, Baker, 1.1905 (TECH); Mosman's Bay, Baker, 10.1891 (TECH); Port Jackson (TECH); Sydney Harbour, ? Mueller, ? 1857 (NSW 22846); Port Jackson, Thozet (K; photograph CANB); South Head, Port Jackson, Thozet (MEL); Yowie Bay, Welsh, 6.1922 (TECH); National Park, Winckler, 8.1929 (NSW 22852); National Park Station to Audley, Johnson, 7.1946 (NSW 22847); above Woronora Dam, Kartzoff, 11.1948 (NSW 22844); Woneora R., Heathcote, Maiden and Boorman, 6.1905 (NSW 22845); Uloola Track, National Park, Johnson, 8.1948 (NSW 6350); Karloo Pool to Uloola Falls, National Park, Johnson, 9.1950 (NSW 22851); Waterfall, Moles, 9.1949 (NSW 22850); behind Mt. Kembla, Chadwick, 7.1951 (NSW 22848); Berrima, Woolls (NSW 23059); Bundanoon, Constable, 1.1950 (NSW 11454); Nowra, Hynes, 1.1900 (TECH); Eden district, Maiden, 11.1901 (NSW 22830).

OTHER REFERENCES: Benth., Fl. Austr. VI (1873) 237 (as *Frenela muelleri*); Gordon, Pinetum, ed. 3 (1880) 122 (as *F. muelleri*); Moore et Betche, Handb. Fl. of N.S.W. (1893) 377 incl. *Callitris endlicheri;* Maiden, Forest Flora (1907) 52; Maiden in Ag. Gaz. N.S.W. XVIII (1907) 659; Baker et Smith, Pines of Australia (1910) 262; Domin in Bibl. Bot. XX (1915) 248 excl. Qld. specimens; Maiden et Betche, Census (1916) 10; Ewart, Handb. For. Trees (1925) 48 (as *C. calcarata* var.); Robertson, Recomm. For. Trees Austr. (1926) 27, 29, 244; Ewart, Fl. Vic. (1930) 63 (as *C. calcarata* var.); Anderson, Trees of N.S.W. (1932) 77, ed. 2 (1947) 129; Dallimore et Jackson, Handb. Conif., ed. 3 (1948) 212; Baird in Phytomorphology III (1953).

13. C. oblonga A. et L. C. Rich., Conif. (1826) 49, t. 18, No. 2.

TYPIFICATION: *Holotype*: R. Brown. The locality Port Jackson is given in error.

SYNONYMS: *Frenela australis* R. Br. ex Mirb. in Mém. Mus. Par. XIII (1825) 74 nomen. Holotype: Terre de Diemen, R. Brown. A specimen labelled *Callitris australis* in the British Museum, Cataract R., Port Dalrymple, R. Brown (Bennet Collection No. 3114), has been sketched for me by Miss N. T. Burbidge and is definitely *C. oblonga.*

Callitris fruticosa R. Br. ex A. et L. C. Rich., Conif. (1826) 49 in synon.

Callitris gunnii Hook. f. in Hook. Lond. Journ. Bot. IV (1845) 147. Holotype: South Esk R., Tasmania, Gunn No. 542, (K; photograph CANB).

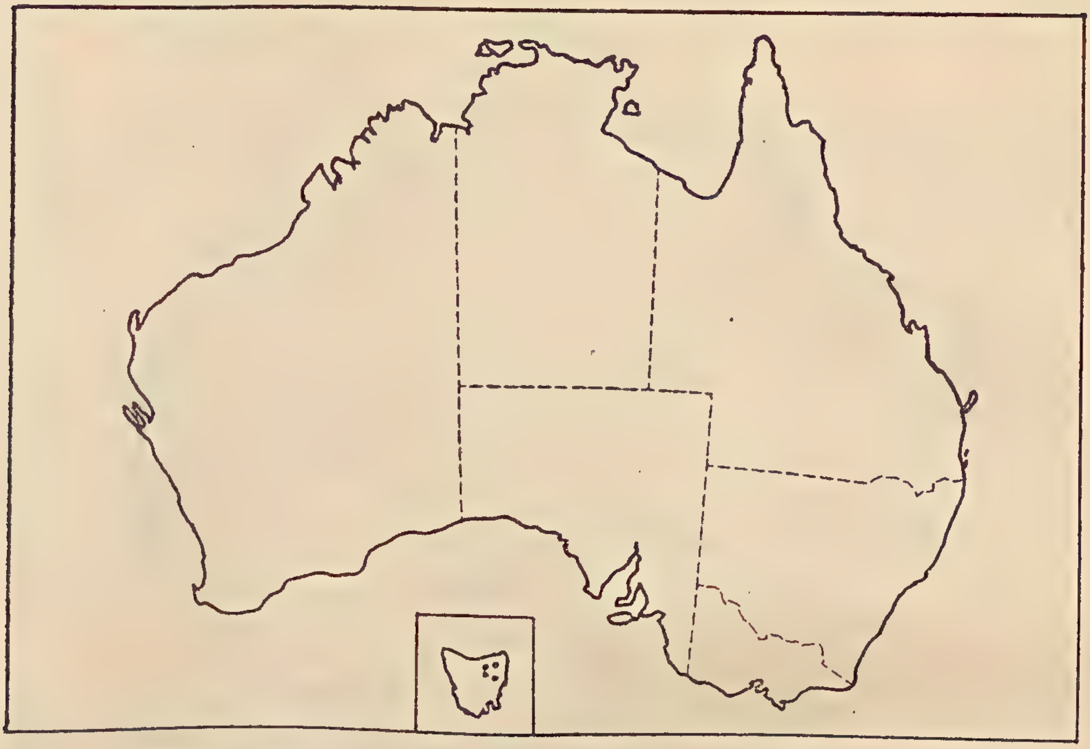
Frenela gunnii (Hook. f.) Endl., Syn. Conif. (1847) 38.

Frenela variabilis Carr., Conif. (1855) 75 (Holotype: a cultivated plant) may belong here.

ILLUSTRATIONS: A. et L. C. Rich., Conif. (1826) t.18, No. 2; Hook. f., Fl. Tasm. I (1857) pl. 97 (as *Frenela australis*); Baker et Smith, Pines of Australia (1910) 26, 272; Jackson in Gard. Chron., ser. 3, LXII (1917) f. 2; Dallimore et Jackson, Handb. Conif., ed. 3 (1948) f. 34.

A small tree or shrub with dense, erect, branches. Leaves usually 0.4-0.5 cm. long, the dorsal surface prominently, but not acutely, keeled. Male cones ovoid to obovoid, up to 0.2 cm. long. Female cones sessile or on short fruiting branchlets, occurring singly or in clusters on the branches and remaining attached after maturity, ovoid, 1.5-2.0 cm. diameter. Cone-scales 6 (8 in cones on juvenile branches), thick, each tapering above to an apex usually thickened by a short dorsal point, the alternate scales very much reduced. Columella short, often 3-lobed. Seeds numerous, dark brown, usually with 2 wings 0.2 cm. wide.

SPECIMENS EXAMINED: See Map 13. *Tasmania*: No locality or collector given (NSW 22795); Tasmania, per Scott, rec. 4.1927 (TECH); Cataract Gorge, Rupp, 11-12.1921 (NSW 22793); Formosa Garden, Gunn No. 542/1842, 9.1842 (NSW 22792); South Esk, Gunn No. 542/1842, 5.1843 (K; photograph CANB); Avoca, Laseron, 6.1908 (TECH); St. Pauls R., Legge, 9.1909 (NSW 22796).



Map 13. Distribution of *C. oblonga.*

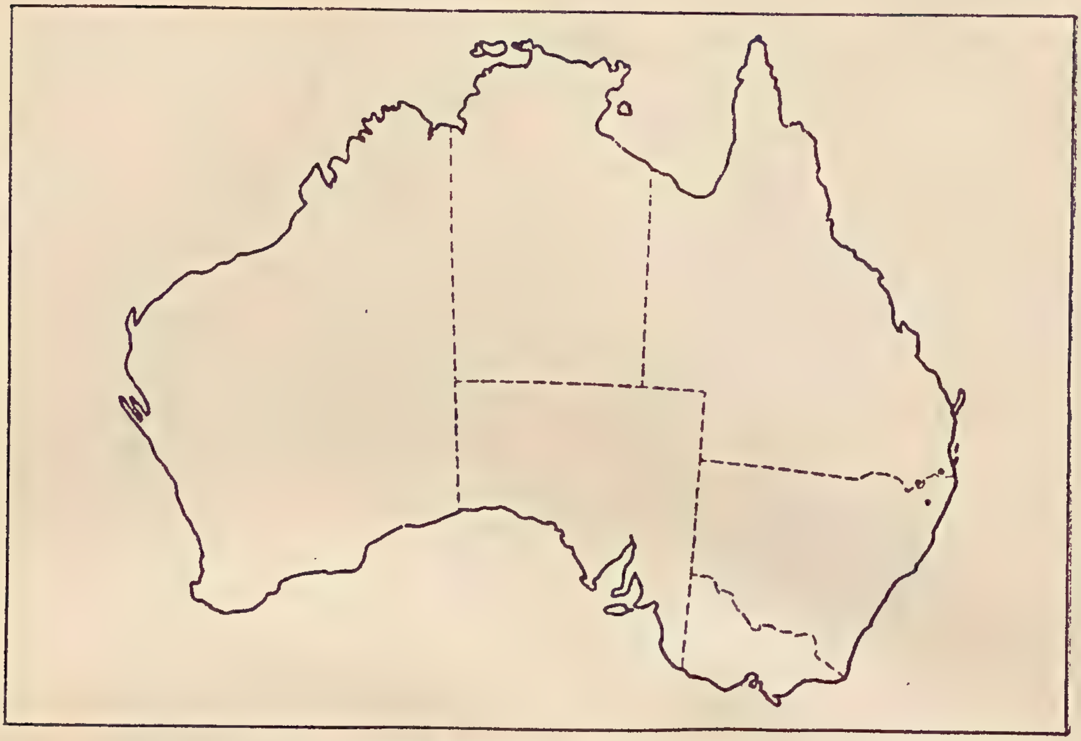
OTHER REFERENCES: Hook. f., Fl. Tas. I (1857) 352 (as *Frenela australis*); Parl. in A. DC., Prod., XVI, pt. 2 (1868) 450 excl. var. *mucronata* (as *F. gunnii*); Benth., Fl. Austr. VI (1873) 239 (as *F. australis*); Gordon, Pinetum, ed. 3 (1880) 120 (as *F. gunnii*); F. Muell., Census (1882) 109; Rodway, Tas. Fl. (1903) 278; Baker et Smith, Pines of Australia (1910) 271; Jackson in Gard. Chron., ser. 3, LXII (1917) 3; Robertson, Recomm. For. Trees Austr. (1926) 244; Dallimore et Jackson, Handb. Conif., ed. 3 (1948) 213.

14. C. monticola sp. nov.

TYPIFICATION: *Holotype*: Wallangarra, Queensland, W. de Beuzeville, 4.1941 (NSW 22815).

Frutex erectus glaucus dense ramosus usque ad 2.5 m. altus. Folia plerumque 0.2-0.4 cm. longa, in dorso manifeste carinata. Strobili masculi ignoti. Strobili feminei solitarii vel plures, in ramulis strobiliferis robustis saepe aggregatis, longe persistentes crasse ovoidei ad depresse globulares, maturi 1.5-2.5 cm. diametro. Squamae 6 crassae, immature in dorso rugosae, unusquisque in dorso infra apicem eminentiam ferens. Squamae alternae minores, majores infra apicem angulatae. Columella magna usque ad 0.5 cm. longa late trilobata. Semina multa fusca 2-alata 0.2-0.3 cm. lata.

An erect, glaucous, bushy shrub up to 2.5 m. high. Leaves usually 0.2-0.4 cm. long, the dorsal surface prominently, but not acutely, keeled. Male cones not seen. Female cones solitary or several together on stout, often clustered, fruiting branchlets, remaining on the branches long after maturing, broadly ovoid to depressed-globular, 1.5-2.5 cm. diameter when mature. Cone-scales 6, thick, the dorsal surface, in the immature cone, closely wrinkled, each with a dorsal protuberance close to the apex, the alternate scales reduced in size, the larger scales angled towards the apex. Columella large, up to 0.5 cm. long, broadly 3-lobed. Seeds numerous, dark brown, with 2 wings 0.2-0.3 cm. wide. "Steelhead."



Map 14. Distribution of *C. monticola*.

SPECIMENS EXAMINED: See Map 14. *Queensland*: above Picnic Creek, Lamington National Park, Johnson, 5.1951 (NSW 22818); Mt. Barney Summit, Constable, 11.1952 (NSW 24359); Bald Knob, Constable, 5.1949 (NSW 22817); Wallangarra, de Beuzeville, 4.1941 (NSW 22815); Wallangarra, Boorman, 7.1904 (NSW 22816).

New South Wales: 40 miles east of Glen Innes, Fraser, 8.1948 (NSW 6365).

OTHER REFERENCES: F. M. Bail., Qld. Flora (1902) 1496 for the most part (as *Callitris muelleri*); F. M. Bail., Compr. Cat. Qld. Pl. (1909-1913) 510 (as *C. muelleri*); Domin in Bibl. Bot. XX (1915) 248 excl. N.S.W. specimens (as *C. muelleri*).

15. C. rhomboidea R. Br. ex. A. et L. C. Rich., Conif. (1826) 47, t. 18, No. 1.

TYPIFICATION: *Holotype*: Nova Hollandia, R. Brown.

SYNONYMS: *Frenela ventenatii* Mirb. in Mém. Mus. Par. XIII (1825) 74 nomen. Holotype: Pt. Jackson, R. Brown. A specimen in the British Museum, labelled *Callitris ventenatii* R. Br., Port Jackson, R. Brown (Bennett Collection No. 3107), has been identified by Miss N. T. Burbidge as *C. rhomboidea*.

Callitris cupressiformis G. Don in Loud., Hort. Brit. (1830) 490 nomen.

Callitris australis R. Br. ex. Hook. f. in Hook. Lond. Journ. Bot. IV (1845) 147 non (Pers.) Sweet. Lectoype: East Coast (Tasmania), J. Backhouse, Gunn No. 543 (K; photograph CANB).

Frenela rhomboidea (R. Br. ex A. et L. C. Rich.) Endl., Syn. Conif. (1847) 36.

Frenela rhomboidea (R. Br. ex A. et L. C. Rich.) Endl. var. *pendula* Parl. in A. DC., Prod. XVI, pt. 2 (1868) 447. Holotype: New South Wales, Vernon.

Frenela gunnii (Hook. f.) Endl. var. *mucronata* Parl. in A. DC., Prod. XVI, pt. 2 (1868) 450. Holotype: Mt. Mitchell, Beckler.

Frenela endlicheri Parl. var. *mucronata* (Parl.) Benth., Fl. Austr. VI (1873) 238.

Frenela attenuata A. Cunn. ex Benth., Fl. Austr. VI (1873) 238 in synon.

Frenela rhomboidea (R. Br. ex A. et L. C. Rich), Endl. var. *tasmanica* Benth., Fl. Austr. VI (1873) 238. Lectotype: Oyster Bay, Gunn (K; photograph CANB).

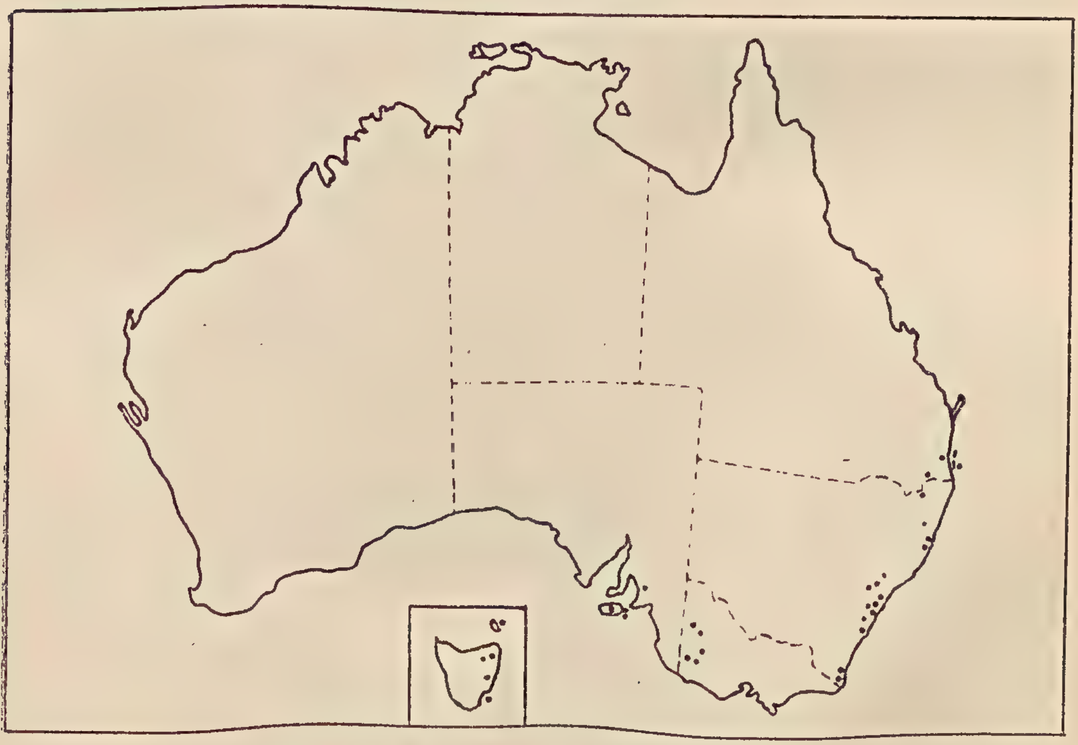
Frenela rhomboidea (R. Br. ex A. et L. C. Rich.) Endl. var. *mucronata* Benth., Fl. Austr. VI (1873 238. Lectotype: Mt. Sturgeon, Victoria, Robertson (K.; photograph CANB).

Callitris tasmanica (Benth.) R. T. Baker et H. G. Sm., Pines of Australia (1910) 233.

Frenela triquetra Spach., Hist. Veg., Phan. XI (1842) 345 (Holotype: a cultivated plant) probably belongs here.

ILLUSTRATIONS: A. et L. C. Rich., Conif. (1826) t.18, No. 1; de Wildeman, Ic. Sel. Hort. Then. III (1902) pl. 115; Maiden, Forest Flora (1907) pl. 48 (as *Callitris cupressiformis*); Maiden in Ag. Gaz. N.S.W. XVIII (1907) 658 (as *C. cupressiformis*); F. M. Bail., Compr. Cat. Qld. Pl. (1909-1913) f. 514 (as *C. cupressiformis*); Baker et Smith, Pines of Australia (1910) 36, 221, 223, and 36, 234, 235, 236, 238 (as *C. tasmanica*); Domin in Bibl. Bot. XX (1915) f. 61 (as *C. cupressiformis*); Ewart, Handb. For. Trees (1925) 45 as *C. cupressiformis*); Black, Fl. S.A., ed. 2 (1943) f. 35 (as *C. tasmanica*).

A tree or shrub, often glaucous, with horizontally spreading, erect or fastigiate branches. Leaves usually 0.2-0.3 cm. long, prominently, but not acutely, keeled. Male cones ovoid to obovoid, up to 0.2 cm. long. Female cones usually several together on clustered fruiting branchlets, remaining on the branches long after maturing, ovoid to depressed-globular, up to 2 cm. diameter. Cone-scales 6, thick, each with a short, broad, conical protuberance on the dorsal surface, the alternate scales usually much reduced in size, the smaller scales tapering towards the apex, the larger wider above and abruptly angled into a short broad apex. Columella usually short, occasionally to 0.3 cm., 3-lobed or 3-partite. Seeds numerous, dark brown, usually with 2 narrow wings 0.1 cm. wide. "Oyster Bay Pine", "Port Jackson Pine".



Map 15. Distribution of *C. rhomboidea.*

SPECIMENS EXAMINED: See Map 15. *Queensland*: Moreton Bay, Cunningham No. 19, 9.1824 (K; photograph CANB); Stradbroke Island, Cunningham No. 145, 9.1824 (K; photograph CANB); Emu Vale, Saunders, 2.1923 (TECH).

New South Wales: Rivertree, Cambage No. 2877, 9.1911 (NSW 22916); Cataract R., east of Tenterfield, Irby, 3.1917 (NSW 22920); Mt. Mitchell, Beckler (NSW 22945); Wild Cattle Creek State Forest, Bailey, 10.1930 (NSW 22914); east of Dorrigo, Swain, 6.1910 (NSW 22918); Dorrigo, Wilshire, 5.1904 (NSW 22919); Sandy Creek, Wollomombi to Guy Fawkes, Johnson, 11.1951 (NSW 17558); Yarrahappini, Rogers, 10.1950 (NSW 22915); Trial

Bay, Boorman, 8.1909 (NSW 22917); 5 miles from Kinchela, Love, 10.1937 (NSW 22912); Kinchela, G.R.B., 2.1898 (NSW 22913); Hat Head, Johnson, 10.1953 (NSW 26213); Hat Head, Constable, 1.1953 (NSW 22383); Crescent Head to Hat Head, McDonald, 3.1953 (NSW 23625); Glen Regis, Bylong, Baker, 1.1904 (TECH); 3 miles east of Curran's Mountain Gap, Johnson, 8.1951 (NSW 22923); head of Coricudgy Creek, Johnson, 8.1951 (NSW 22927); near Wolgan R., Deane, 8.1906 (NSW 22922); Wolgan Valley, Cambage No. 1556, 8.1906 (NSW 22926); north and north-east of Wallerawang, Hadley, 5.1924 (NSW 22924); Newnes Railway Line, Constable, 12.1948 (NSW 17198); Berowra, Fraser, 8.1940 (NSW 22943); Manly, Boorman, 9.1903 (NSW 22942); near North Head, Port Jackson, Hooker (K; photograph CANB); Clontarf, Cannon, 4.1909 (TECH); Middle Harbour, Cannon, 1.1907 (TECH); Middle Harbour, Legge, 11.1911 (NSW 22908); Mosman, Cannon, 8.1907 (TECH); Kogarah Bay, Camfield, 1896 (NSW 22941); Georges R., Woronora R., Como, Taylor, 1.1909 (TECH); Como, Duggan, 10.1933 (NSW 22946); Como, Fletcher, 8.1889 (NSW 22907); Como, Boorman, 9.1916 (NSW 22910); Sylvania, Vickery, 12.1949 (NSW 17727); Yowie Bay, Welch, 6.1922 (TECH); Oyster Bay, 10.1952 (NSW 22905); Port Hacking R., Camfield, 12.1898 (NSW 22944); National Park, Maiden, 7.1903 (NSW 22945); Kangaroo Creek, National Park, Johnson, 1.1946 (NSW 22940); Leumeah, Johnson, 11.1948 (NSW 22906, 22909); Menangle, Harper, 11.1893 (TECH); between Yanderra and Yerrinbool, Mair, 3.1952 (NSW 22921); Parma Creek, Tomerong, Rotton, 6.1904 (NSW 22898, 22899, 22900); Greig's Flat, Pambula, Cheel, 6.1917 (NSW 22901); Eden, Fraser, 1.1935 (NSW 22903, 22904); Broadwater Lake, near Eden, Kartzoff, 3.1951 (NSW 22902); Green Cape Lighthouse road, Constable, 10.1954 (NSW 30257); Disaster Bay, Constable, 10.1954 (NSW 30249).

Victoria: Australia felix (NSW 22960, 22961); Little Desert, 9 miles south of Kiata, Musgrave, 10.1948 (NSW 22958); Wail, Little Desert, per Forests Nursery, 11.1952 (NSW 22952); about 1 mile above Hall's Gap, Grampians, Garden, 4.1952 (NSW 22959); Grampians, Williamson, 11.1904 (NSW 22956), 12.1902 (NSW 22957), 11.1903 (TECH); Grampians, Fisher (NSW 22953); Grampians, Mueller (K; photograph CANB); Mt. Sturgeon, Robertson (K; photograph CANB); Wando Vale, Robertson (NSW 22955).

South Australia: Mt. Crawford Forest Reserve near Williamstown, Forest Officer, 10.1949 (NSW 22947); Slaps Gully, Mt. Lofty Range, Black, 3.1913 (NSW 22949); Hog Bay, Kangaroo Island, 1.1893 (TECH); Hog Bay, Kangaroo Island, Maiden, 1.1907 (NSW 22948); Cape Willoughby, Pink Bay, Kangaroo Island, Sealy (NSW 22951; Harriet R., Mainsail Boom R. and Western River, Kangaroo Island, Gill, 5.1907 (NSW 22950).

Tasmania: Flinders Island, Archer, 1.1911 (NSW 22965); Flinders Island, Gunn No. 1017, 8.1844 (NSW 22967; K; photograph CANB); Tasmania, Gunn No. 543, 1844 (K; photograph CANB); Tasmania, Legge, 9.1909 (NSW 22963); Tasmania, Stuart, 1842 (NSW 22966); Garden Formosa, Gunn No. 543/1842, 9.1841 (NSW 22969); Cullenswood, Legge, 1.1911 (NSW 22964); St. Mary's to Bicheno, Ford, 9.1950 (NSW 22968); Swanport to Swansea, Maiden, 1.1902 (NSW 22962); Coast of Oyster Bay, Gunn No. 543/1842, 4.1840 (NSW 22971); Oyster Bay, Gunn (K; photograph CANB); Oyster Bay, Laseron, 1908 (TECH); East Coast, Backhouse (K; photograph CANB); Port Arthur, Maiden, 2.1906 (NSW 22970).

OTHER REFERENCES: Endl., Syn. Conif. (1837) 36 (as *Frenela triquetra*); Hook. f., Fl. Tas. I (1857) 352 (as *F. rhomboidea*); Parl. in A. DC., Prod. XVI, pt. 2 (1868) 447 (as *F. rhomboidea*); Benth., Fl. Austr. VI (1873) 237 (as *F. rhomboidea*); Gordon, Pinetum, ed. 3 (1880) 117 (as *F. australis*); F. Muell., Census (1882) 109 (as *Callitris cupressiformis*); F. Muell., Key Syst. Vic. Pl. (1887-8) 402 (as *C. cupressiformis*); Moore et Betche, Handb. Fl. N.S.W. (1893) 377 (as *C. cupressiformis*); F. M. Bail., Qld. Flora (1902) 1497 (as *C. cupressiformis*); Rodway, Tas. Fl. (1903) 278; Maiden, Forest Flora (1907) 61 (as *C. cupressiformis*); Maiden in Ag. Gaz. N.S.W. XVIII (1907) 659 (as *C. cupressiformis*); F. M. Bail., Compr. Cat. Qld. Pl. (1909-1913) 510 (as *C. cupressiformis*); Domin in Bibl. Bot. XX (1915) 248 (as *C. cupressiformis*); Maid. et Betche, Census (1916) 10 (as *C. cupressiformis*); Black, Fl. S.A. (1922) 45 (as *C. cupressiformis*), and 663 (as *C. tasmanica*); Ewart, Handb. For. Trees (1925) 47 (as *C. cupressiformis*); Robertson, Recomm. For. Trees Austr. (1926) 29, 92, 244, and 115, 244 (as *C. tasmanica*); Ewart, Fl. Vic. (1930) 64 (as *C. cupressiformis*); Anderson, Trees of N.S.W. (1932) 77, 120 (as *C. cupressiformis*); Black, Fl. S.A., ed. 2 (1943) 45 (as *C. tasmanica*); Anderson, Trees of N.S.W., ed. 2 (1947) 197 (as *C. cupressiformis*); Dallimore et Jackson, Handb. Conif., ed. 3 (1948) 209 (as *C. cupressiformis*), and 216 (as *C. tasmanica*); Baird in Phytomorphology III (1953).

16. **C. endlicheri** (Parl.) comb. nov.

TYPIFICATION: *Lectotype*: Futter's (in error Fuster's) Range, F. Mueller, 19.2.1853 (MEL).

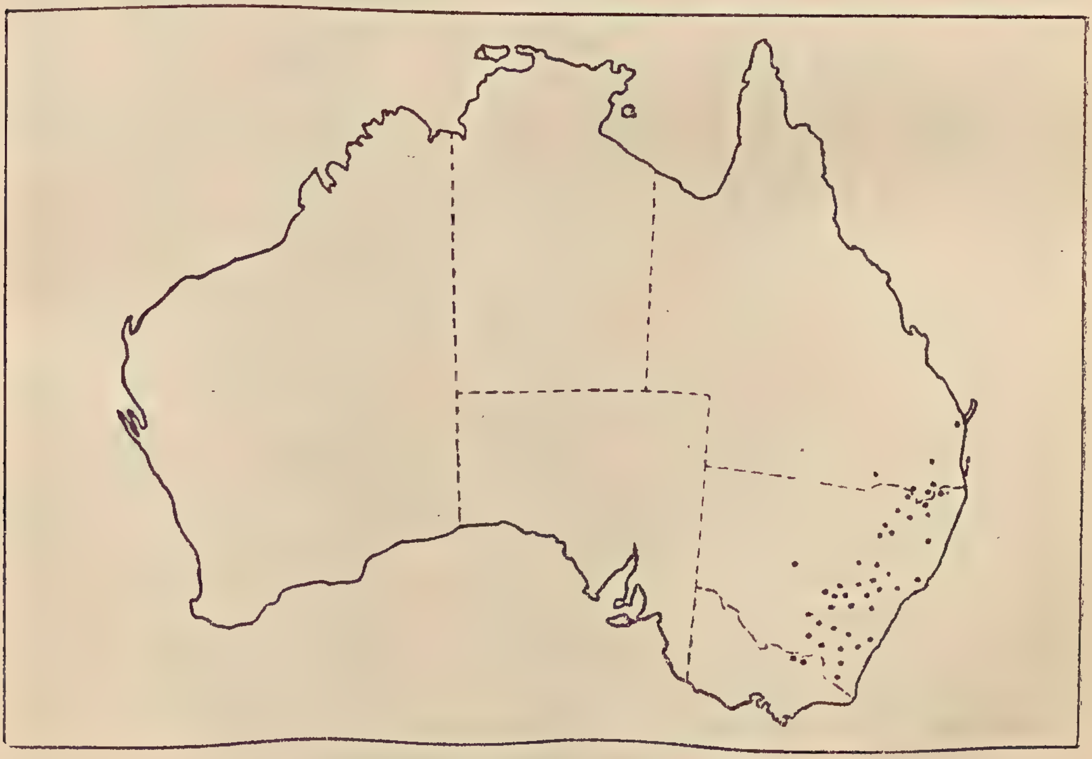
SYNONYMS: *Frenela calcarata* A. Cunn. ex Mirb. in Mém. Mus. Par. XIII (1825) 74 nomen. Holotype: intérieur de la Nouvelle-Galles du Sud.

Frenela endlicheri Parl. in A. DC., Prod. XVI, pt. 2 (1868) 449. Lectotype: Futter's Range, F. Mueller, 19.2.1853 (MEL).

Callitris calcarata (A. Cunn. ex Mirb.) F. Muell., Census (1882) 109 nom. illegit.

ILLUSTRATIONS: Cambage in Proc. Linn. Soc. N.S.W. XXIX (1904-5) t. 24 (as *Callitris calcarata*); Maiden, Forest Flora (1907) pl. 48 (as *C. calcarata*); F. M. Bail., Compr. Cat. Qld. Pl. (1909-1913) f. 515 (as *C. calcarata*); Baker et Smith, Pines of Australia (1910) 36, 71, 193, 195 (as *C. calcarata*); Ewart, Handb. For. Trees Vic. (1925) pl. 8 (as *C. calcarata*); Robertson, Recomm. For. Trees Austr. (1926) f. 17 (as *C. calcarata*); Baird in Phytomorphology III (1953) f. 20 (as *C. calcarata*).

A tree, occasionally glaucous, with spreading branches. Leaves usually 0.2-0.4 cm. long, the dorsal surface prominently, but not acutely, keeled. Male cones ovoid to obovoid, up to 0.3 cm. long. Female cones solitary or several together on rather slender, usually clustered, fruiting branchlets, ovoid to globular or depressed-globular, up to 2 cm. diameter but usually smaller. Cone-scales 6, each with a small dorsal point near the apex, the alternate scales much reduced in size, the larger scales usually angled, but occasionally tapering, towards the apex. Columella variable, usually very short, 3-partite or with 3 or 4 separate parts. Seeds numerous, dark brown, usually with 2 wings less than 0.3 cm. wide. "Black Cypress Pine", "Red Cypress Pine".



Map 16. Distribution of *C. endlicheri*.

SPECIMENS EXAMINED: See Map 16. *Queensland*: Hibbett's Mt., Gundiah, Kajewski No. 1511, 11.1930 (NSW 23081); Braemar, Dalby district (TECH); Balonne (NSW 23082; MEL); near Stanthorpe, Whaite No. 302, 8.1949 (NSW 23083); Yelarbon to Whetstone, Johnson and Constable, 11.1954 (NSW 30261); Stanthorpe, Boorman, 7.1904 (NSW 23080); Wallangarra, Constable, 5.1947 (NSW 3705).

New South Wales: 2 miles west of Amosfield, Johnson, 11.1951 (NSW 28062); Yetman, Swain, 7.1911 (NSW 23017); Jennings, Maiden and Boorman, 12.1903 (NSW 23070); Silent Grove, Boorman, 11.1919 (NSW 23063); Bolivia, Betche, 11.1886 (NSW 23065); Torrington, Boorman, 1.1916 (NSW 23067), 10.1911 (NSW 23068); Consuls, Emmaville, Baker, 6.1894 (TECH); Emmaville, Boorman, 10.1901 (NSW 23072), 10.1911 (NSW 23073); Emmaville

(NSW 23071); Mosquito Creek, Mair, 3.1951 (NSW 23014); Warialda, Rupp, 7.1905 (NSW 23019); Warialda, Boorman and Maiden, 8.1905 (NSW 23020); near Warialda, Whaite No. 1028, 8.1951 (NSW 23029); Oakey Creek, Warialda, Laseron, 4.1911 (TECH); Inverell, Baker, 7.1911 (TECH); near Inverell, Stopford, 5.1904 (NSW 23018); Howell, Hart, 10.1905 (NSW 23021); Howell, Maiden and Boorman, 8.1905 (NSW 23022); 23 miles north-east of Narrabri, Lee, 5.1919 (NSW 23023); Narrabri district, Burrow, 9.1921 (NSW 23015); Boggabri, Maiden, 11.1899 (NSW 23024); Castlereagh R., Woolls (NSW 23016); Castlereagh R. (MEL); Pilliga scrub, Jensen, 8.1911 (NSW 23034); south-east Pilliga, Swain, 8.1913 (NSW 23026); about 10 miles north-north-west of Borah, Swain, 8.1913 (NSW 23025, 23031); about 10 miles north-west of Borah, Swain, 8.1913 (NSW 23028); near Mt. Yarraran, Swain, 9.1911 (NSW 23032); Forked Mt., 6 miles from Coonabarabran, Jensen, 8.1911 (NSW 23225); Forked Mt., Coonabarabran, Boorman, 9.1908 (NSW 23027); Warrumbungles, de Beuzeville, 12.1915 (NSW 23030); Warrumbungle Range, Swain, 9.1911 (NSW 23033); Mt. Naman, Warrumbungles, Correy, 8.1953 (NSW 25209); Carlisle, Hardy, 12.1933 (NSW 23069); Liverpool Plains, Cunningham 5.1825 (K; photograph CANB); Mendooran to Coonabarabran, Welch, 9.1926 (TECH); Head of Apsley Falls, Johnson, 10.1953 (NSW 26170); Tia Falls, Forsyth and Cheel, 10.1900 (NSW 23064); Tia Cannon, Maiden, 11.1897 (NSW 23066); Gilgandra, Irby, 6.1914 (TECH); Gilgandra, Withers, 10.1921 (NSW 17217); 17 miles north of Dunedoo, Garden, 10.1949 (NSW 22973, 22995); Goonoo State Forest, Dubbo to Mendooran, Chippendale and Constable, 9.1951 (NSW 17490); Leadville, Green, 11.1899 (TECH); Dunedoo, Johnson and Constable, 8.1950 (NSW 16051); 3 miles south of Cassilis, Kartzoff, 11.1950 (NSW 22992, 22993); Cobbora-Boomly road, Johnson and Constable, 8.1950 (NSW 16061); Cobbora, Garden, 10.1949 (NSW 22972, 22994); Merriwa, Maiden and Boorman, 5.1902 (NSW 22974); Shuttleton, Bauerlen, 11.1903 (TECH); Dubbo, Boorman, 12.1897 (NSW 22982), 8.1903 (NSW 22978), 6.1914 (NSW 22979); Dubbo, Marriott, 5.1904 (NSW 22983); Dubbo, McMaster, 9.1907 (NSW 22976); Minore, Boorman, 2.1899 (NSW 22989); Ulan, Johnson and Constable, 8.1950 (NSW 16230); Monkerai, Laseron, 7.1909 (TECH); Lee's Pinch, Wollar-Merriwa Road, Johnson, 9.1951 (NSW 17640); Wybong Hills, Leichhardt (NSW 22975); Wybong Creek to Sandy Hollow, Johnson, 4.1953 (NSW 23436); Mebul, Cross, 9.1938 (NSW 22991); Gulgong, Maiden and Boorman, 4.1901 (NSW 22990); Denman, Macqueen, 7.1913 (NSW 22987); Denman, Stafford, 5.1945 (NSW 22996); Murrumbo, Baker, 10.1893 (TECH); Cox's Gap, Kerrabee, Johnson, 4.1953 (NSW 23438); Tal Tal Mt., Upper Bylong, Johnson, 10.1951 (NSW 17460); Talleghany, Stroud, Laseron, 7.1910 (TECH); Stroud, Laseron, 7.1909 (TECH); Mudgee-Wollar road, Constable, 6.1950 (NSW 22997, 23056, 23057); Bylong, Baker, 9.1895 (TECH); Ranges on the banks of Bylong Creek, Baker, 11.1892 (TECH); Talooby, Baker, 9.1895 (TECH); Wellington, Bauerlen, 2.1903, 1.1903 (TECH); Wellington, Baker, 7.1909 (TECH); Buccaroo, Maiden, 3.1896 (TECH); Luc, Boorman, 4.1901 (NSW 22988); Pokolbin, Cambage No. 1505, 4.1906 (NSW 23074); South of Broke, Vickery, 9.1951 (NSW 17464); about 20 miles north of Condobolin, Fawcett, 7.1921 (NSW 22986); Harvey Range State Forest about 10 miles south-east of Baldry, 11.1920 (NSW 22980); Harvey Ranges, Boorman, 11.1905 (NSW 22981); Hill End, Wiburd, 12.1936 (NSW 22984); Bogan Gate, Ising, 4.1924 (NSW 22985); Bumberry, Maiden, 8.1897 (NSW 22977); Manildra, Laseron, 7.1911 (TECH); Cookamidgera, Constable, 9.1947 (NSW 5250); Cookamidgera, Welch, 1.1926 6.1923 (TECH); Rylstone, Baker, 12.1890, 12.1898 (TECH); Mt. Baker, Coricudgy Range, Baker, 10.1897 (TECH); near Newnes, McLeod, 7.1926 (NSW 23055); Newnes Railway Line, Constable, 12.1948 (NSW 17200); Bowan Park, Blakely, 10.1906 (NSW 23060); Toogong, Osborne, 8.1905 (NSW 22999); Forbes, Garling, 10.1912 (NSW 23001); Eugowra, Osborne, 8.1905 (NSW 23000); Pine Ridge, Bathurst, Johnston (TECH); Bathurst, Cunningham No. 54, 11.1825 (K; photograph CANB); Wallerawang, Boorman, 12.1917 (NSW 19874); Port Jackson, D'Urville, 1826 (G; photograph NSW); Cox's R., Bennett, 9.1911 (TECH); Central Cox's R., near Kill's Defile, Johnson, 6.1946 (NSW 23058); Lachlan R., Cunningham No. 375, 4.1817 (K; photograph CANB); Grenfell, Kartzoff, 2.1953 (NSW 23008); near Grenfell, Osborne, 4.1904 (NSW 23002); Mt. McDonald, Maiden and Boorman, 6.1907 (NSW 23061); Abercrombie Falls, Mair, 10.1951 (NSW 17471); Weddin, Maiden, 12.1899 (NSW 22998); Cocaparra Range, McCormick, 12.1911 (NSW 23013); Temora, Betche, 5.1907 (NSW 23007); Temora, Cheel, 7.1926 (NSW 23006); Temora, Dwyer, 6.1913 (NSW 23005); Temora, Boorman, 11.1917 (NSW 23004); near Combaning, Vickery, 10.1953 (NSW 26404); Temora State Forest, south-west of Temora, Constable, 4.1948 (NSW 17201); Wallendbeen, de Beuzeville, 6.1932 (NSW 23003); Longreach, Shoalhaven R., Laseron, 10.1909 (TECH); Burrinjuck, Cheel, 1.1912 (NSW 23009, 23011); Mallabo Range, near Wagga, Fletcher, 10.1809 (NSW 23012); The Rock, 8.1909 (NSW 23010); Queanbeyan, Murphy, 3.1898 (NSW 23035); Shoalhaven R., 9 miles west of Braidwood, Constable, 12.1950 (NSW 16295); Shoalhaven R., 7½ miles from Braidwood, 10.1908 (NSW 23043); Booroomba, Barker, 2.1906 (TECH); Talbingo, de Beuzeville, 9.1919 (NSW 23046); Bogong, north-north-west of Talbingo, de Beuzeville, 9.1919 (NSW 23045); Michelago, Boorman, 1.1909 (NSW 23044); Little Tinderry Mountains, Michelago, Boorman, 1.1909 (NSW 23048); Tumbarumba, Boorman, 10.1916 (NSW 23407); Cooma, Boorman, 9.1913 (NSW 23038), 12.1914 (NSW 23041), 11.1915

(NSW 23053); Cooma, Betche, 12.1890 (NSW 23052); Cooma, Martin, 7.1904 (NSW 23050); Cooma, Maiden, 12.1896 (NSW 23049); near Snowy R., south of Paupong, Costin, 11.1948 (NSW 23036, 23037, 23039); Jacob's R., per Forestry Commission, 7.1942 (NSW 23054); Jacob's and Snowy Rivers, Costin, 11.1948 (NSW 23040); near Snowy R., south of Jimenbuen, Costin, 11.1948 (NSW 23051); Quiedong, about 15 miles west of Bombala, Campbell, 5.1904 (NSW 23042).

Victoria: Beechworth, Meebold No. 21534, 11.1936 (NSW 27522); Futters Range, Mueller, 2.1853 (MEL); between the Ovens R. and Mayday Hills, Mueller (MEL).

OTHER REFERENCES: Benth., Fl. Austr. VI (1873) 238 excl. var. (as *Frenela endlicheri*); F. Muell., Key Syst. Vic. Pl. (1887-8) 402 (as *Callitris calcarata*); Moore et Betche, Handb. Fl. N.S.W. (1893) 377 (as *C. calcarata*), and 377 incl. *C. muelleri* (as *C. muelleri*); F. M. Bail., Qld. Flora (1902) 1497 (as *C. calcarata*); Maiden, Forest Flora (1907) 57 for the most part (as *C. calcarata*); Maiden in Ag. Gaz. N.S.W. XVIII (1907) 659 (as *C. calcarata*); F. M. Bail., Compr. Cat. Qld. Pl. (1909-1913) 510 excl. synon. (as *C. calcarata*); Baker et Smith, Pines of Australia (1910) 192 (as *C. calcarata*); Maiden et Betche, Census (1916) 10 (as *C. calcarata*); Ewart, Handb. For. Trees (1925) 47 (as *C. calcarata*); Robertson, Recomm. For. Trees Austr. (1926) 56, 58, 78, 241 (as *C. calcarata*); Ewart, Fl. Vic. (1930) 62 excl. var. (as *C. calcarata*); Anderson, Trees of N.S.W. (1932) 15, 78 (as *C. calcarata*), ed. 2 (1947) 15 (as *C. calcarata*); Dallimore et Jackson, Handb. Conif., ed. 3 (1948) 209 (as *C. calcarata*); Baird in Phytomorphology III (1953) (as *C. calcarata*).

UNIDENTIFIED SPECIES.

Cupressus australis Pers., Syn. II (1807) 580. Based on a specimen without cones.

Thuja australis Bosc. ex Desfont., Hort. Par. II (1815) 274.

Callitris australis (Pers.) Sweet, Hort. Brit., ed. 2 (1830) 474.

Cupressus fothergillii Forbes, Pinet. Woburn. (1839) 191. Based on a juvenile specimen.

Cupressus articulata Forbes, l.c. Based on a juvenile specimen.

Frenela australis (Pers.) Endl., Syn. Conif. (1847) 37.

Frenela fothergillii (Forbes) Endl., l.c., 38.

Frenela australis (Bosc. ex. Desfont.) Gordon, Pinet. (1858) 83.

Frenela pyramidalis Carr. ex Gordon, l.c., 86.

Frenela crassivalvis Miq., Stirp. Nov. Holl. Muell. Coll., Ned. Kruid. Arch. IV (1859) 97. The specimens cited by Miquel have not been traced in Mueller's herbarium at Melbourne. A specimen (NSW 23242) labelled *Frenela crassivalvis* Miquel, Murray, by Mueller is *Callitris preissii* ssp. *verrucosa*.

Callitris verrucosa F. Muell., Rep. Burdek. Exped. (1860) nom. illegit. The specimen cited by Mueller has not been traced in his herbarium at Melbourne.

Octoclinis backhousei Hill, Cat. Nat. Ind. Prod. Qld. Int. Exhib. (1862). Based on a specimen without cones exhibited at the 1862 International Exhibition (see Bentham, Fl. Austr. VI (1863) 238).

Octoclinis juniperoides Carr., Conif., ed. 2 (1867) 790. I have not seen this reference. If this name is not validly published neither is the following.

Frenela juniperoides (Carr.) Parl. in A. DC., Prod. XVI, pt. 2 (1868) 451.

Callitris articulata (Forbes) Gordon, Pinet., ed. 3 (1880) 117 in synon.

UNIDENTIFIED NOMINA NUDA.

Cupressus macrocarpa Oxley, Journ. Exped. N.S.W. (1820) 216.

Juniperus rigida Noisette ex Desf., Hort. Par., ed. 3 (1829) 355.

Juniperus ericoides Noisette ex Desf., l.c.
Callitris arenosa Sweet, Hort. Brit., ed. 2 (1830) 473.
Callitris pyramidalis Sweet, l.c.
Callitris conglobata Sieb. ex Heynh., Nom., I (1840) 148.
Callitris elegans Sieb. ex Heynh., l.c., 149.
Callitris montana Sieb. ex Heynh., l.c.
Callitris macrostachya Hort. ex. Steud., Nom., ed. 2, I (1840) 260.
Callitris fothergillii Loud., Encycl. Trees (1842) 1072.
Frenela ericoides (Noisette ex Desf.) Endl., Syn. Conif. (1847) 38.
Frenela macrostachya (Hort.) Endl., l.c.
Frenela pyramidalis (Sweet) Endl., l.c.
Frenela rigida (Noisette ex Desf.) Endl., l.c.
Frenela arenosa (Sweet) Endl., l.c.

EXCLUDED NAMES.

Frenela fontanesii Mirb. in Mém. Mus. Par. XIII (1825) 74 nom. illegit. et nomen = *Tetraclinis.*

Callitris quadrivalvis A. et L. C. Rich., Conif. (1826) t. 8, f. 1 = *Tetraclinis.*

Callitris articulata (Vahl.) Link., Handb. II (1831) 473 = *Tetraclinis.*

Callitris triquetra (Lodd. ex Loud.) Loud., Encycl. Trees and Shrubs (1842) 1072 nomen = *Widdringtonia.*

Callitris arborea Schrad. ex E. Mey., Pfl. Docum. (1844) 73 nomen = *Widdringtonia.*

Callitris cupressoides Schrad. ex. E. Mey., l.c., 126 = *Widdringtonia.*

Callitris stricta Schrad. ex Carr., Conif. (1855) 66 = *Widdringtonia.*

Callitris capensis Schrad. ex Gordon, Pinet. (1858) 333 in synon. = *Widdringtonia.*

Callitris actinostrobus F. Muell., Rep. Burdek. Exped. (1860) 9 nom. illegit. = *Actinostrobus.*

Callitris sinensis Soubeiran, Mat. Méd. Chin. (1874) 134 nomen = *Boswellia.*

Frenela actinostrobus F. Muell., Sel. Pl. Industr. Cult. (1876) 94 nom. illegit = *Actinostrobus.*

Callitris acuminata (Parl.) F. Muell., Census (1882) 109 = *Actinostrobus.*

Callitris commersonii (Brongn.) Th. Dur. et Schinz., Consp. Fl. Afr. V (1895) 951 = *Widdringtonia.*

Callitris juniperoides (L.) Th. Dur. et Schinz., l.c. = *Widdringtonia.*

Callitris whytei (Rendle) Engl., Pflw. Ost. Afr. (1895) 93 = *Widdringtonia.*

Callitris swartzii Marloth in Engl. Jahrb. XXXV (1905) 206 = *Widdringtonia.*

Callitris mahonii (Mast.) Engl., Pflw. Afr. II (1908) 88 in obs. = *Widdringtonia.*

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A Review of the Family Oleaceae

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Summary.

A revised system of the subfamilies, tribes and genera of the Oleaceae is provided, in the form of a key and annotated enumeration. The following are recognised: Subfamily Jasminoideae with tribues Jasmineae (*Jasminum, Menodora*), Fontanesieae H. Taylor ex L. Johnson, trib. nov. (*Fontanesia*), Forsythieae H. Taylor ex L. Johnson, trib. nov. (*Forsythia, Abeliophyllum*), Schrebereae trib. nov. (*Schrebera, Comoranthus*), Myxopyreae trib. nov. (*Myxopyrum*); Subfamily Oleoideae with tribes Fraxineae (*Fraxinus*) and Oleeae (incl. "Syringeae") (remaining genera). The genera *Olea* L., *Notelaea* Vent. and *Osmanthus* Lour. are re-defined and *Tetrapilus* Lour. and *Gymnelaea* (Endl.) Spach are revived, with appropriate new combinations. *Amarolea* Small and *Picconia* DC. are also recognised. *Leuranthus* Knobl. is re-united with *Olea* L. *Nyctanthes* L. and *Dimetra* Kerr are excluded from the family (referred to Verbenaceae). General discussion of the taxonomy of the family is provided, and special reference is made to the work of Taylor (1945).

INTRODUCTION.

The family Oleaceae, comprising about 30 genera and probably between 400 and 500 species, is neither too small for notice nor too large for convenience. Moreover it is well represented in every continent and in both cool and warm climates, and includes quite conspicuous tree species as well as a number of garden and economic plants. It is therefore surprising that the general systematics of the family has been somewhat neglected, though individual, chiefly North-Temperate, genera such as *Fraxinus, Syringa* and *Ligustrum* have been well studied.

When investigating the New South Wales species of *Notelaea,* I found that *N. ligustrina* Vent. differed considerably in general aspect and in the aestivation of the corolla from the other species. This prompted some investigation of the extra-Australian species which at one time or another had been referred to *Notelaea.* It soon became evident that certain genera of the tribe Oleeae were not readily distinguished, especially in the Pacific area. To remedy this it was necessary to consider the whole of the tribe, which in turn led inescapably to the view that several genera, notably *Olea, Notelaea* and *Osmanthus,* have not been satisfactorily defined and, as hitherto treated, are scarcely natural assemblages. Finally this led to the consideration of the other genera and the characteristics of the tribes and subfamilies. Hence this paper.

Herein is put forward, in the form of a synoptic key and enumeration, a provisional revised system of the Oleaceae, together with such notes and comments as seem pertinent.

A thorough monograph on modern lines is needed but is beyond the scope of materials and time available to me. A future monographer may find these notes of some value; in the meantime they should be useful to those who must deal with Oleaceae in their day-to-day work.

GENERAL.

The last review of the Oleaceae as a whole is that of Knoblauch (1895) in "Die Natürlichen Pflanzenfamilien". It is now greatly out-of-date and incomplete but is the basis of most subsequent work. Lingelsheim (1920) in "Das Pflanzenreich" treated in greater detail the tribes Fraxineae and Syringeae (in Kloblauch's sense). Knoblauch has at various times published further brief contributions, transferred species and described new genera. Other authors (Gilg, 1902, p. 139; Gilg and Schellenberg, 1913, pp. 73-74; Smith, 1916; Nakai, 1919; Stapf, 1929 and Small, 1933) have described some small genera but only two important papers have dealt with a substantial part of the family. Neither of these was formally taxonomic, but they are both of considerable value in an understanding of the family.

Sax and Abbe (1932), though dealing only with some of the more familiar horticultural members of the family, found from a study of chromosome numbers, comparative wood anatomy and grafting relationships that the traditional alignment of genera in the subfamilies Oleoideae and Jasminoideae, though generally acceptable, was not altogether satisfactory in detail. Six genera of three tribes of the Oleoideae had the basic haploid chromosome number 23 (sometimes 22 or 24 in *Syringa*) but *Forsythia* (traditionally placed in the Oleoideae—Syringeae) had 14 and moreover would not form compatible grafts with other Oleoideae. *Jasminum* was found to have a haploid number of 13.

This suggestive work was continued by Taylor (1945), who made a cytotaxonomic survey of fourteen genera, representing all major groups in the family. He found that the basic chromosome number 23 occurred in all three tribes of the Oleoideae but was universal (in the genera studied) only in the Oleeae. The Fraxineae included *Fraxinus* (23) and *Fontanesia* (13), and the Syringeae included *Syringa* (23) and *Forsythia* (14). In the Jasmineae the number 23 did not occur, but *Jasminum* had 13 chromosomes and *Menodora* 11. Polyploidy within genera and species was rare.

Following up these results with general morphological observations Taylor concluded that *Fontanesia, Forsythia* and also *Abeliophyllum* (x=14) were not naturally placed in the Oleoideae. With these genera (and possibly *Schrebera* and *Myxopyrum*) excluded, he considered the Oleoideae to be a natural group with "an allopolyploid origin as the result of hybridisation of 11- and 12-chromosome prototypes that are not known to exist at the present time." Within the Oleoideae he continued to recognise the three tribes Syringeae (*Syringa* and perhaps *Schrebera*), Fraxineae (*Fraxinus*) and Oleeae* (*Ligustrum, Olea, Osmanthus,* × *Osmarea* (i.e. *Phillyrea* × *Siphonosmanthus*), *Phillyrea, Chionanthus* and *Forestiera*). The remaining genera placed by Knoblauch in the tribe but not studied by Taylor himself he considered should be left in Oleeae, with the exception of the anomalous *Myxopyrum* which "should probably be separated".

Whereas Oleoideae constitutes a natural though secondarily diversified group, Taylor considered that "the other genera which contain the most primitive forms make up a rather heterogeneous group, the Jasminoideae". He stressed that "As a result of convergent evolution, it is difficult to divide the family into natural groups on the basis of morphological characters alone. Hence, the group has been rearranged on the basis of chromosome numbers, and the structure of the flowers and fruits studied in the light of the changes necessitated by such a system". In particular the traditional characters of "ovules ascending, fruit bilobed (Jasminoideae)" *versus* "ovules pendulous, fruit not bilobed (Oleoideae)" must be abandoned or at least much qualified. The points of division used by Taylor are incorporated in the key to the tribes below (p. 399).

The heterogeneous Jasminoideae, then, distinguished chiefly by not being Oleoideae, were grouped by Taylor in three tribes, Jasmineae (*Jasminum*: x=13, *Menodora*: x=11); Fontanesieae† (*Fontanesia*: x=13, *Abeliophyllum*: x=14) and Forsythieae† (*Forsythia*: x=14).

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* Like earlier authors Taylor used the form "Oleinae". Under the International Code of Botanical Nomenclature (1952) Art. 29, however, the correct form in the rank of tribe is "Oleeae".

† Written "Fortaneseae" and "Forsytheae" by Taylor.

Nyctanthes, pending chromosomal evidence, was left in the Jasminoideae with reservations. However, as Airy Shaw (1952) and Stant (1952) have pointed out, *Nyctanthes* (with the related *Dimetra* Kerr) is quite anomalous in the Oleaceae and should undoubtedly be placed in the Verbenaceae. With this conclusion I entirely agree; it is only surprising that this comparatively well-known but quite un-Oleaceous plant should have been retained in the family so long.

Taylor's work is basic in the understanding of the Oleaceae and I am greatly indebted to it. The arrangement of the tribes which follows is largely derived from it but differs in certain respects, viz.: (i) the transfer of *Abeliophyllum* from Fontanesieae to Forsythieae and consequent amendment of the definitions of those tribes; (ii) the recognition of a distinct tribe Myxopyreae provisionally referred to the Jasminoideae; (iii) the removal of *Schrebera* and *Comoranthus* from the Oleoideae (Syringeae and Oleeae respectively) and their grouping as a new tribe Schrebereae provisionally referred to the Jasminoideae (*Noldeanthus* may also belong to this tribe); (iv) the transfer of *Syringa* to the Oleeae and the consequent disappearance of Syringeae as a tribe; (v) the replacement of Fraxineae at the beginning of the Oleoideae. Taylor was conscious of the resemblance between *Abeliophyllum* and *Forsythia* so that (i) is not revolutionary; (ii) is an obvious necessity since *Myxopyrum* is clearly quite anomalous in the Oleeae and differs from all other tribes; (iii) is, in part, foreshadowed by Taylor's remarks but is further justified by the findings of Perrier de la Bâthie (1950); (iv) must logically follow from the close relationship between *Syringa* and *Ligustrum* and (v) is a matter of convenience with apparently little against it — moreover it is the traditional treatment.

Since Taylor unfortunately did not validate his new tribes by formal Latin descriptions, diagnoses for these as well as for Schrebereae and Myxopyreae are here provided.

Fontanesieae *H. Taylor ex L. Johnson,* tribus nov. Oleacearum-Jasminoidearum.

Ovula in loculo ovarii unoquoque 1, pendula. Fructus indehiscens septo contrarie compressus, fere circumalatus. Petala 4, sublibera basibus in paribus connata. Frutices foliis deciduis simplicibus, medulla ramulorum continua. Chromosomata gametica 13. Genus typicum (unicum): *Fontanesia* Labill.

Forsythieae *H. Taylor ex L. Johnson,* tribus nov. Oleacearum-Jasminoidearum.

Ovulae in loculo ovarii unoquoque 1 vel plures, pendulae. Fructus vel indehiscens septo contrarie compressus fere circumalatus vel capsula bilocularis loculicida, coriacea vel dura, septo parallele compressiuscula, seminibus alatis. Corolla gamopetala lobis 4, aestivatione imbricata. Frutices foliis deciduis simplicibus vel tripartitis vel trifoliolatis, medulla ramulorum interrupta (lamellata vel internodiis fistulosis). Chromosomata gametica 14. Genus typicum: *Forsythia* Vahl.

Schrebereae *L. Johnson,* tribus nov. Oleacearum (-Jasminoidearum?).

Ovulae in loculo ovarii unoquoque 4, pendulae. Fructus capsula lignosa, seminibus pendulis, alatis. Corolla gamopetala, tubo longo vel brevi, lobis 4-8, aestivatione imbricata. Arbores vel frutices, foliis persistentibus imparipinnatis vel simplicibus, marginibus integris. Genus typicum: *Schrebera* Roxb.

Myxopyreae *L. Johnson,* tribus nov. Oleacearum (-Jasminoidearum?).

Ovulae in loculo ovarii unoquoque 1-3, adscendentes. Fructus carnosus endocarpio crustaceo. Semina 1 vel 2 erecta. Corolla parva, tubo plus minusve urceolato, lobis 4, aestivatione valvata. Frutices scandentes vel semiscandentes, ramis valde quadrangulatis, foliis persistentibus, simplicibus, integris vel dentatis, valde triplinervibus. Genus typicum (unicum): *Myxopyrum* Bl.

In the key here given the tribes and genera are dealt with in a synoptic manner so that at least some of their truly characteristic attributes may be determined from the key itself. However, it is not claimed that the genera are arranged in their natural order (if there is such a thing) within the tribes. Detailed morphological, anatomical and cytological studies will be necessary before the evolutionary relationships can be worked out. I am by no means convinced that the character of imbricate *versus* valvate aestivation divides the Oleeac into entirely natural groups and would have preferred not to use this rather inconvenient character as a major dividing point. Since, however, I have seen no material of some of the smaller and rarer genera their characters have been ascertained from the descriptions of Knoblauch and others. These authors paid great attention to the aestivation but not to other characteristics which may have been more convenient; thus the use of "valvate *vs.* imbricate" was unavoidable if these genera were to be included. The more obscure characters of ovule insertion, presence of endosperm, etc., are mentioned only when of vital importance and one can use the key without recourse to these. Those wishing to know more of the genera in this respect may find the details in Knoblauch's papers or in the original descriptions.

With due care it should be possible to determine the genus of any specimen which has flowers and buds. If fruits are available as well identification will be more rapid. If old flowers or fruits alone are available an identification will still usually be possible if one seeks the "best fit", especially if the geographical origin is known. The key is rather complicated in places, so that all possibilities are covered, and repetition has also been necessary in order to retain the diagnostic and truly dichotomous character of the key. In particular the Jasminoideae are not a coherent assemblage so that the two subfamilies can only be definitely separated by listing a number of character combinations.

Those genera which are here re-defined, revived in generic rank or re-united with other genera are discussed at the end of the Key. If not so discussed they are defined as by Knoblauch (1895) and subsequent authors, or as in the original descriptions.

Notes on Terminology.

1. *Inflorescence.* The inflorescence in Oleaceae is fundamentally dichasially cymose (i.e., definite, with a terminal flower to every shoot, and two branches per node). However, the main axes are usually prolonged through several nodes and lateral branching more or less suppressed so that the general effect is of *racemes* (no lateral branching of the second degree), *panicles* (lateral branching of second, and sometimes higher degrees present) or *fascicles* (main axes very short so that all the pedicels appear to arise from the axil or near it. The fascicles may be fundamentally either racemose or paniculate). The terms are used in this modified sense throughout. An "expanded panicle" is one which is not markedly fasciculate or merely a raceme with a single (racemose) branch; the end-systems of an "expanded panicle" may nevertheless be more or less congested.

2. *Aestivation.* In *imbricate* aestivation the overlapping of the edges of the corolla-lobes in bud is usually quite obvious with a hand-lens. In *valvate* aestivation the edges of the corolla-lobes meet in a definite line in bud; usually but not always these edges are also more or less induplicate.

3. *Corolla.* If the corolla is present it is readily seen, never being hidden by the calyx. Consequently if no corolla is discernible in any part of an inflorescence in which the ovaries have not enlarged at all, it may be concluded that the corolla is absent.

4. *Microcrystalline deposits.* These are obvious to the naked eye as a white or bluish "bloom" on petioles, midribs and margins of leaves. They consist of minute acicular crystals.

KEY I.*

Key to the Subfamilies and to the tribes and genera of Jasminoideae.

1. Ovules in each cell of the ovary 1,4, or numerous and variable in number, or if 2 then ascending. Fruit one of the following: (a) a bilobed transversely dehiscent capsule; (b) a bilobed berry (one lobe sometimes ± aborted); (c) a compressed nut with a surrounding wing; (d) a longitudinally dehiscent capsule, either thick-walled and woody or if thin-walled then the pith of the branchlets interrupted or hollow and corolla lobes imbricate and longer than the tube; (e) a berry or drupe with thin endocarp (in this case the seeds erect and the plant a climber with strongly quadrangular stems and triplinerved leaves). Corolla various, 4-12-merous, never absent. Leaves various: if pinnate, trifoliolate, lobed or 1-foliolate (with articulate petiole) then corolla with a definite tube and imbricate lobes, usually rather large; if truly simple then low shrubs or undershrubs with bilobed ovary, or if larger the pith of the branchlets interrupted, or the corolla bearded within or tomentose within and without, or leaves deciduous and flowers with 4 small almost free petals and long stamens, or climbing plants with triplinerved leaves and strongly quadrangular branchlets. Chromosome number 11, 13 or 14. .... Subfamily JASMINOIDEAE.

2. Fruit a bilobed capsule or berry (one lobe sometimes ± aborted). Either low shrubs or undershrubs with simple or 1-3-pinnatisect leaves (rarely almost leafless) or erect or scrambling shrubs or woody climbers with imparipinnate, trifoliolate or unifoliolate (petiole articulate) leaves. Corolla rather large with a well-developed tube and 4-12 imbricate lobes. Basic chromosome number 11 or 13. .... JASMINEAE.

3. Fruit a bilobed transversely dehiscent capsule. Low shrubs or undershrubs with simple or 1-3-pinnatisect leaves (rarely almost leafless). Basic chromosome number 11. N. & S. America and S. Africa. .... *Menodora* Humb. & Bonpl. 1.

3.* Fruit a bilobed berry (one lobe frequently ± aborted). Shrubs or climbers with imparipinnate, trifoliolate or 1-foliolate leaves. Basic chromosome number 13. Africa, Eurasia, Australia, Oceania and possibly trop. America. .... *Jasminum* L. 2.

2.* Fruit not bilobed. Erect trees or shrubs (sometimes with pendulous branches or woody climbers with truly simple leaves. Leaves simple, imparipinnate or rarely trifoliolate or trilobed. Corolla various, large or small. Plants with at least one (not all) of the following features not found in Jasmineae: Interrupted pith; petals small, almost free; corolla bearded within or tomentose within and without, or leaves truly simple and triplinerved.

4. Fruit dry, a capsule or winged nut. Ovules pendulous. Leaves not triplinerved. Shrubs or trees, rarely with weeping branches but scarcely climbing. Branchlets terete to strongly quadrangular. Corolla large or small.

5. Petals free or united only in pairs at the base, small. Fruit indehiscent, compressed, with a surrounding wing. Foliage deciduous, leaves simple. Pith uninterrupted. Basic chromosome number 13. Mediterranean Region and E. Asia .... FONTANESIEAE. *Fontanesia* Labill. 3.

5.* Corolla with a definite tube; lobes 4-8, imbricate, large or small. Fruit either indehiscent, compressed with a surrounding wing or more often a capsule. Foliage deciduous or evergreen; leaves simple, trifoliolate or imparipinnate. Pith interrupted or uninterrupted.

6. Fruit either a leathery or hard but not woody capsule or indehiscent, compressed with a surrounding wing. Foliage deciduous; leaves simple, trilobed or trifoliolate. Pith interrupted (lamellate or present only at nodes). Corolla glabrous. Basic chromosome number 14. .. FORSYTHIEAE.

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* *Noldeanthus* Knobl., a genus of uncertain position, is omitted from the key. It may be distinguished from Jasmineae by the unlobed ovary and pendulous ovules, and from all other genera by the combination of climbing habit, trifoliolate leaves and uniovulate ovary-cells. S.W. Africa.

7. Fruit a compressed nut with surrounding wing. Corolla-lobes about equal to tube. Inflorescence of short axillary racemes. Leaves simple, entire. Korea. .... *Abeliophyllum* Nakai 4.

7.* Fruit a 2-celled leathery or hard-walled capsule with several narrowly-winged seeds. Corolla-lobes longer than tube. Inflorescence of short axillary fascicles. Leaves simple or 3-lobed to trifoliolate; margins ± toothed or entire. S. Europe (Albania) and E. Asia. .. *Forsythia* Vahl 5.

6.* Fruit a thick-walled woody capsule with winged seeds. Foliage evergreen; leaves imparipinnate or simple, margins entire. Pith uninterrupted. Corolla bearded within or tomentose within and without. Chromosome number unknown. .... SCHREBEREAE.
[Provisionally referred to Jasminoideae.]

8. Leaves simple. Corolla tomentose or velvety within and without; tube rather short. Stamens inserted near base of corolla. Style very short or stigma sessile. Elongated "seminodes" present. Madagascar and Comores. .... *Comoranthus* Knobl. (ampl. H. Perrier) 6.

8.* Leaves imparipinnate or simple. Corolla-tube usually longer than lobes, brown- or purple-bearded towards throat, but corolla not tomentose within and without. Stamens inserted in upper part of tube. Heterostylous, style either as long as tube or considerably shorter. "Seminodes" (sterile seeds) absent. Africa to India (and Peru?). .... *Schrebera* Roxb. 7.

4.* Fruit fleshy, with thin endocarp. Ovules ascending; seeds erect. Leaves simple, strongly triplinerved. Scrambling climbers with strongly quadrangular branchlets. Corolla small; tube ± urceolate. Chromosome number unknown. S.E. Asia. .... MYXOPYREAE.
[Provisionally referred to Jasminoideae.] *Myxopyrum* Bl. 8.

1.* Ovules in each cell of the ovary 2 (exceptionally more), pendulous. Fruit never bilobed; one of the following: (a) indehiscent with terminal wing (a samara); (b) a leathery capsule (in this case the pith of the branchlets uninterrupted and the corolla-lobes valvate and shorter than the tube); (c) a berry or drupe with thin or thick endocarp (in this case the seed or seeds pendulous and the plants erect shrubs or trees with rounded or weakly quadrangular stems and leaves never strongly triplinerved). Corolla various, usually 4-merous, occasionally 5-6-merous, sometimes absent. Leaves various: if pinnate, trifoliolate, lobed or 1-foliolate then corolla absent or small with a very short tube or if long-tubed (*Syringa*) then lobes valvate; if simple then ovary never bilobed, the pith of the branchlets never interrupted, the corolla not bearded or tomentose; if leaves simple and deciduous then flowers not with 4 small almost free petals and long stamens, and never climbing plants with triplinerved leaves and strongly quadrangular branchlets. Basic chromosome number 23 (rarely 24 or 22?) .... Subfamily OLEOIDEAE.
(See Key II.)

KEY II.

Subfamily Oleoideae.

1. Fruit dry, indehiscent: a samara with terminal wing. Foliage deciduous; leaves imparipinnate, rarely trifoliolate or 1-foliolate; leaflet margins usually serrate or crenulate, rarely entire. Inflorescence a panicle (sometimes rather dense and fascicle-like). Petals 0, 2 or 4, free or shortly united at the base. Eurasia and N. America. .... FRAXINEAE.
Fraxinus L. 9.

1.* Fruit either fleshy (a drupe or berry) or a leathery 2-celled loculicidal capsule. Foliage evergreen or deciduous; leaves simple or rarely lobed or pinnatisect (if the latter then the corolla with a long tube); margins entire or toothed. Inflorescence various (panicle, raceme, fascicle, rarely a spike). Corolla present or absent; tube long, short or none. .... OLEEAE.

2. Fruit a leathery 2-celled capsule; seeds winged. Corolla present, often pink to purple (rarely whitish); tube usually longer than the valvate lobes (if about equal then panicles not truly terminal though often lateral at end of shoot). Inflorescence an axillary or terminal panicle. Foliage deciduous; leaves simple (and entire) or rarely lobed or pinnatisect. Eurasia. .... *Syringa* L. 10.
(Incl. *Ligustrina* Rupr., excl. *Parasyringa* W.W. Sm.—see *Ligustrum*.)

2.* Fruit a drupe or berry (very rarely finally dehiscent as in *Ligustrum* sect. *Sarcocarpion*). Corolla present or absent, white, yellowish or brownish, tube various, often short; lobes valvate or imbricate in bud. Inflorescence a panicle, raceme, fascicle or (rarely) a spike. Foliage evergreen or deciduous; leaves simple, entire or toothed. (If foliage deciduous and corolla-tube as long as or longer than lobes (*Ligustrum*) then inflorescence a truly terminal panicle—contrast short-tubed spp. of *Syringa* above.)

3. Corolla always present (though occasionally rather caducous) except in pistillate flowers of some *Tetrapilus* spp. (then inflorescence a ± expanded panicle—contrast *Forestiera* and *Gymnelaea* below). Corolla-lobes valvate or valvate-induplicate in bud. Leaves entire or rarely dentate (if dentate then inflorescence an expanded panicle—see *Tetrapilus*). [If type of aestivation indeterminable try both sections of key; usually a good fit will be found in one only or the genus will appear in both.]

4. Inflorescence ± paniculate (i.e. branching of the second degree present to some extent, though very little in some genera), though panicles sometimes contracted and fasciculate.

5. Corolla without an internal coronule (cf. 5* *Noronhia*, below), variously shaped but not urceolate or markedly campanulate and if tube long then corolla not thick or fleshy. Inflorescence a panicle, raceme or fascicle.

6. Inflorescence ± expanded (sometimes a fasciculate panicle in *Linociera*). Corolla-lobes variously shaped but never with narrowed elongated involute tips. (Contrast 6* *Dekindtia*, below.)

7. Inflorescence usually manifestly paniculate (contrast 7* below) though sometimes congested (branching of the second degree usually well-developed—if relatively little developed other characters not as in 7*). Stamens 2 or rarely 3-4. Corolla-lobes various, free or with a definite tube.

8. Corolla-tube longer than or at least equal to lobes. Style elongated to very short or none.

9. Panicles terminal. Style slender, rather long; stigmas ± elongated. Leaves entire, sometimes deciduous. Eurasia to Trop. Australia. .... *Ligustrum* L. 11.
(Incl. *Parasyringa* = *Syringa* § *Sarcocarpion*.)

9.* Panicles axillary, rarely terminal (?). Style none or very short; stigma short. Leaves more or less dentate or entire, evergreen. S.E. Asia and Malaysia. (See also 12* below). .... *Tetrapilus* Lour. 13.

8.* Corolla-tube shorter than lobes, or petals free, or united in pairs at the base. Style usually short or none.

10. Corolla-lobes linear to broad-oval, never truly terete or laterally compressed (sometimes apparently terete through inrolling of margins when dry in *Linociera*) (if narrow-linear then panicles axillary).

11. Corolla about as long as broad in bud, with a short tube. Panicles terminal or axillary. Stigma entire or very shortly bilobed.

12. Plants never pilose or pubescent (except sometimes ciliate calyx margins) but frequently with a lepidote indumentum (or apparently quite glabrous). Leaves always entire. Panicles axillary and/or terminal. Stigma usually entire, ± helmet-shaped, or rarely slightly bilobed-capitate. Africa, S. Asia, E. Australia, Lord Howe Is., N. Caledonia ...... *Olea* L. 12.
(Incl. *Leuranthus* Knobl.)

12.* Inflorescence, etc., often ± pilose or pubescent, plant without lepidote indumentum. Leaves dentate or entire. Panicles axillary (or rarely terminal ?). Corolla-tube frequently rather well developed. Stigma shortly bilobed. S.E. Asia and Malaysia. .... *Tetrapilus* Lour. 13.

11.* Corolla from slightly to much longer than broad in bud; lobes finally free or very shortly united in pairs at the base; rarely with a very short tube. Panicles axillary or rarely terminal (then very lax) sometimes ± fasciculate. Stigma shortly bilobed or almost undivided. Plants never prominently lepidote, but frequently pilose or pubescent, esp. the inflorescence.

13. Foliage usually evergreen, ± coriaceous except in young shoots (rarely deciduous and rather thin). Corolla-lobes slightly to considerably elongated (but less than 1.0 cm.), united in a short tube or in pairs at the base or quite free. Inflorescence an axillary panicle, sometimes condensed and fascicle-like or reduced and racemose; pedicels various but less than 0.6 cm. long. Tropics and subtropics of Africa, Asia, Malaysia, Australia and America. .. .. *Linociera* Sw. 15.
(See also 14* and 15, below.)

13.* Foliage deciduous; leaves thin-textured. Corolla-lobes much elongated (1.5 to 4 cm.) and linear, white, united at base only. Inflorescence a terminal or axillary panicle; pedicels slender, 0.6-1.5 cm. long. E. Asia and Eastern N. America .... *Chionanthus* L. 16.

10.* Corolla-lobes linear, fleshy, terete or laterally compressed, shortly united at the base. Panicles terminal or axillary. W. Indies. .... *Haenianthus* Griseb. 17.

7.* Inflorescence almost racemose (very little branched in the second degree). Stamens 4. Corolla-lobes linear, free or very shortly united.

14.* Fruit with a thin crustaceous endocarp. Leaves sessile. Little-known genus. Brazil. .... *Tessarandra* Miers 18.

14. Fruit with a thick bony endocarp, large (at least 1.5 cm. long). Leaves shortly petiolate. Lord Howe Is. (See also 13, above and 15, below.) .... *Linociera* Sw. 15.
(In part: *L. quadristaminea.*)

6.* Inflorescence fasciculate (but branched in the second degree). Corolla-lobes linear-lanceolate with narrowed elongate involute tips. Corolla-tube short. Little-known genus. W. Africa. .... **Dekindtia* Gilg & Schellenb. 19.

5.* Corolla usually with a manifest coronule (nectary), resembling a small second corolla, inside the base of the tube and corolla usually urceolate or campanulate and thick and fleshy (always so if lacking coronule); tube as long as or longer than lobes. Inflorescence paniculate, racemose or rarely reduced to a single flower. Madagascar and Comores. .... *Noronhia* Stadtm. 20.

4.* Inflorescence a simple raceme (never branched in the second degree), elongated or short (occasionally reduced to a few-flowered fascicle in *Notelaea*), sometimes 2 or more racemes in each axil. Corolla-lobes free or united in pairs at the base only. Style very short or none.

15. Stamens 4. Drupe large (1.5-3.0 cm.). Stigma shortly bilobed. Petals free, narrow-linear. Leaf-venation obscure. Lord Howe Is. (See also 13 and 14* above.) .... *Linociera* Sw. 15.
(In part: *L. quadristaminea.*)

15.* Stamens 2. Drupe less than 1.5 cm. long. Stigma bifid (lobes ± appressed in *Picconia*). Corolla with a very short tube or lobes almost free, united in pairs at the base only. Leaf-venation from prominently reticulate to obscure. [A very few spp. of *Linociera* may have the inflorescence reduced to a group of racemes. These may be distinguished from *Notelaea* by the elongated corolla and the lack of strongly reticulate venation, and from *Picconia* by the small linear bracts and lack of terminal inflorescence.]

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* = *Linociera*, see Addendum, p. 416.

16. Corolla-lobes short and thick-textured, markedly induplicate in bud. Racemes all axillary, bracts usually small and linear or sometimes leaflike. Stigma bifid; lobes ± spreading. Leaves usually without white crystalline deposit, often with strongly reticulate venation. E. Australia. .... *Notelaea* Vent. 21.

16.* Corolla-lobes ± elongated. Racemes both axillary and terminal, with large deciduous concave ciliate bracts. Stigma bifid; lobes erect, sometimes ± appressed or incurved. Leaves (esp. petioles) usually with white microcrystalline deposit; venation not strongly reticulate. Canary Is. & Azores. (See also at 23* below.) .... *Picconia* DC. 27.

3.* Corolla present or absent; if present, the corolla-lobes imbricate (at least at the apex) in bud. Leaves entire or dentate (if dentate then inflorescence never an expanded panicle). [See note under 3, above.]

17. Inflorescence an expanded panicle, axillary or terminal. Corolla present. Corolla-tube much shorter than the lobes or petals quite free. Leaves entire.

18. Petals free, spathulate, clawed. Stamens 4. Lower California (Mexico). .... *Hesperelaea* A. Gray 29.

18.* Corolla with a short tube or lobes united at the base in pairs, never spathulate or clawed. Stamens 2. Tropical Africa. .. *Steganthus* Knobl. 14.

17.* Inflorescence fasciculate or racemose or (in *Amarolea*) a once-branched raceme but never an expanded panicle, chiefly axillary, occasionally terminal as well. Corolla present or absent, tube various. Leaves entire or toothed.

19. Corolla absent. Foliage deciduous or evergreen.

20. Foliage usually deciduous (rarely evergreen); leaf-margins usually ± toothed (rarely entire). Inflorescence a short, very slender, frequently fascicle-like raceme. Stigma small, very shortly bilobed or entire. N., C., & S. America. .... *Forestiera* Poir. 28.

20.* Foliage evergreen, leaf-margins entire. Inflorescence a ± elongated raceme (sometimes 2 or more racemes in an axil). Stigma deeply bifid, lobes spreading. N. Zealand & Norfolk Is. (See also 23, below.) .... *Gymnelaea* (Endl.) Spach (in part) 22.

19.* Corolla present. Foliage evergreen.

21. Inflorescence racemose (sometimes once-branched), never fasciculate or very short and slender. Leaves entire.

22. Racemes usually once-branched; bracts persistent, thick, not markedly ciliate. Pedicels rather short and thick. Corolla-tube about as long as lobes. Stigma entire or shortly bilobed. Leaves without white crystalline deposit. Eastern N. America. .... *Amarolea* Small 23.

22.* Racemes quite unbranched (though sometimes 2 or more superposed in each axil); bracts ± deciduous and thin, either small and narrow or large and markedly ciliate. Pedicels from short to long, not very thick. Corolla-tube from very short to about as long as lobes. Stigma from shortly bilobed to deeply bifid. Leaves (esp. petioles) frequently with white microcrystalline deposit.

23. Bracts small, not whitish and prominently ciliate. Corolla-tube from very short to as long as lobes; lobes not greatly elongated (0.3 cm. or less). Stigma shortly bilobed to deeply bifid with spreading or rather erect lobes. Hawaii, N. Caledonia, S.E. Australia (see also 20*, above.) .... *Gymnelaea* (Endl.) Spach (in part) 22.

23.* Bracts rather large, whitish, concave, and ciliate on the margins. Corolla tube very short or lobes merely joined in pairs at the base; lobes elongated (0.5 cm. or more). Stigma bifid with erect or slightly incurved, sometimes appressed, lobes. Azores and Canary Is. (See also 16*, above.) .... *Picconia* DC. 27.

21.* Inflorescence fasciculate (or a very short fascicle-like panicle) or a short slender raceme. Leaves dentate or entire.

24. Corolla-tube much longer than lobes. Inflorescence fasciculate. Leaves dentate. India to China. .... *Siphonosmanthus* Stapf 25.
24.* Corolla-tube shorter than or sub-equal to lobes. Inflorescence fasciculate or shortly racemose. Leaves dentate or entire.
  25. Fruit with a hard bony endocarp. Inflorescence fasciculate or a very short fascicle-like panicle. Pedicels at least 0.5 cm. long. Leaves without white crystalline deposit. E. Asia. ... . *Osmanthus* Lour. 24.
  25.* Fruit with a thin papery endocarp. Inflorescence a short slender raceme or fascicle. Pedicels short (0.1-0.4 cm.). Leaves (esp. petioles) frequently with a white microcrystalline deposit. Mediterranean region. .... *Phillyrea* L. 26.

ENUMERATION.

Note: Synonymy is given only in cases of re-interpretation here or by recent authors. Otherwise it may be found in the references cited.

Subfamily JASMINOIDEAE Knobl. (emend. H. Taylor).

Tribe **Jasmineae.**

1. Menodora *Humb. et Bonpl.*, Pl. Aequin. II (1809) 98; Knobl. in Engler et Prantl, Nat. Pflanzenfam. IV^2 (1895) 13; Steyermark in Ann. Missouri Bot. Gard. XIX (1932) 113.

Type sp.: *M. helianthemoides* Humb. et Bonpl.

About 17 spp. in N. & S. America & S. Africa in 3 discontinuous areas.

2. Jasminum *L.*, Sp. Pl. I (1753) 7, Gen. Pl. ed. 5 (1754) 7; Knobl. in Engler et Prantl, Nat. Pflanzenfam. IV^2 (1895) 15; Kobuski in Journ. Arn. Arb. XIII (1932) 145, l.c. XX (1939) 64, 403.

Type sp.: *J. officinale* L. (lectotype).

About 200 spp. in Africa, Asia, Australia, chiefly in the tropics and subtropics, 1 species in S. Europe and one reported from Peru.

Taylor (1945) has pointed out the artificiality of the traditional sections based on leaf division and has suggested a more natural basis of division. The genus needs revision.

Tribe **Fontanesieae** H. Taylor ex L. Johnson (see p. 397).

As here interpreted the tribe includes only *Fontanesia*. *Abeliophyllum*, which was included in it by Taylor (1945), seems better placed in Forsythieae though it is similar in fruit to *Fontanesia*.

3. Fontanesia *Labill.*, Icon. Pl. Syr. I (1791) 9, t.I; Knobl. in Engler et Prantl, Nat. Pflanzenfam. IV^2 (1895) 5; Lingelsh. in Engler, Pflanzenr. IV^{243} (1920) 7.

Type sp.: *F. phillyreoides* Labill.

2 spp. in Mediterranean Region and China.

Taylor (1945) has given convincing reasons for excluding this genus from the Oleoideae-Fraxineae. It is apparently a rather specialised relic genus with a discontinuous distribution.

Tribe **Forsythieae** H. Taylor ex L. Johnson (see p. 397).

4. Abeliophyllum *Nakai* in Bot. Mag. Tokyo XXXIII (1919) 1534, Fl. Sylv. Kor. X (1929) 59.

Type sp.: *A. distichum* Nakai.

1 sp. in Korea.

Because of the resemblance of the fruit to that of *Fontanesia*, Taylor (1945) referred *Abeliophyllum* to the Fontanesieae, but pointed out its general resemblance to *Forsythia*. On the whole it seems more like the latter genus, with which it shares the chromosome number x = 14. Perhaps the three genera should all be placed in one tribe.

5. **Forsythia** *Vahl*, Enum. Pl. I (1804) 39, *nom. conserv. propos.;* Knobl. in Engler et Prantl, Nat. Pflanzenfam. IV^{2} (1895) 7; Lingelsh. in Engler, Pflanzenr. IV^{243} (1920) 109.

TYPE SP.: *F. suspensa* (Thunb.) Vahl (*Syringa suspensa* Thunb.)

7 or 8 spp., one in S. Europe (Albania), the rest in E. Asia.

Tribe **Schrebereae** L. Johnson (see p. 397).

This new tribe is based on fruit characters combined with corolla aestivation, general habit and distribution. Whether it is truly natural is uncertain. Chromosome counts are desirable to settle its true position. I have provisionally placed it in the Jasminoideae because it seems out of place in the Oleoideae.

6. **Comoranthus** *Knobl.* in Notizbl. Bot. Gart. Berlin XI (1934) 1032; H. Perrier in Mém. Inst. Sci. Madagascar, Sér. B. II (1950) 304.

TYPE SP.: *C. obconicus* Knobl.

3 spp. in Madagascar and the Comores.

The fruits were unknown to Knoblauch who placed the genus in the Oleeae. Perrier de la Bâthie (1950) discusses its affinity with *Schrebera* and with *Noronhia*. The similarity to *Noronhia* (Oleeae) may well be superficial since it differs considerably in the gynoecium and fruit. A relationship with *Schrebera* seems probable but it is possible that the resemblance is due to convergence.

7. **Schrebera** *Roxb.*, Pl. Coromandel. II (1789) 1, t.101, *nom. conserv.;* Lingelsh. in Engler, Pflanzenr. IV^{243} (1920) 95; *Nathusia* Hochst. in Flora XXIV (1841) 671; Knobl. in Engler et Prantl, Nat. Pflanzenfam. IV^{2} (1895) 7 (Type sp.: *N. alata* Hochst.).

TYPE SP.: *S. swietenioides* Roxb.

About 25 spp. in Africa and India, 1 sp. reported from Peru—a startling and suspicious discontinuity.

Taylor (1945) doubted whether *Schrebera* was correctly placed in the Syringeae. *Syringa* resembles *Ligustrum* (tr. Oleeae) much more than *Schrebera*, nevertheless it is possible that there is a relationship. Chromosome counts of *Schrebera* are needed.

7a. **Noldeanthus** *Knobl.* in Rep. Spec. Nov. XXXVIII (1935) 74.

TYPE SP.: *N. angolensis* Knobl.

1 sp. in Angola.

This genus is of uncertain position. Knoblauch (1935) relates it to *Schrebera* but it differs strikingly in the number of ovules (1 per loculus) as well as in corolla, habit and leaves. Possibly the relationship is with *Jasminum*. Fruits are unknown. *Noldeanthus* is not covered in the diagnosis of the tribe Schrebereae given above (p. 397).

Tribe **Myxopyreae** L. Johnson (see p. 397).

8. Myxopyrum *Bl.,* Bijdr. (1826) 683; Knobl. in Engler et Prantl, Nat. Pflanzenfam. IV^2 (1895) 13.

Type sp.: *M. nervosum* Bl.

3 spp. in S.E. Asia and Malaysia.

This genus, though probably truly Oleaceous, is clearly anomalous in the Oleeae where it has been placed. Although its true position is somewhat obscure its characters and aspect suggest that it should be placed in a tribe of its own probably within the rather heterogeneous Jasminoideae.

Subfamily OLEOIDEAE.

Tribe **Fraxineae** Endl. (emend. H. Taylor).

9. Fraxinus *L.,* Sp. Pl. I (1753) 1057, Gen. Pl. ed. 5 (1754) 447; Knobl. in Engler et Prantl, Nat. Pflanzenfam. IV^2 (1895) 5; Lingelsh. in Engler, Pflanzenr. IV^{243} (1920) 9.

Type sp.: *F. excelsior* L. (lectotype).

Some 60-70 spp. in Eurasia, N. Africa, and N. America, chiefly temperate.

A rather isolated genus within the Oleoideae showing varying degrees of floral reduction, reaching the limit in sect. *Fraxinus* (*"Fraxinaster"*) subsect. *Bumelioides,* where the flowers have neither corolla nor calyx.

Tribe **Oleeae** ("Oleinae" auct.) (emend. Taylor 1945, et L. Johnson 1957).
(Incl. Syringeae G. Don (emend. H. Taylor), p.p. typica).

It is difficult to arrange the genera according to their natural relationships. The order adopted here may have no evolutionary significance but closely related genera are contiguous wherever possible.

10. Syringa *L.,* Sp. Pl. (1753) 9, Gen. Pl., ed. 5 (1754) 9; Knobl. in Engler et Prantl, Nat. Pflanzenfam. IV^2 (1895) 7 (excl. Sect. *Sarcocarpion* Franch.); Lingelsh. in Engler, Pflanzenr. IV^{243} (1920) 74.

Type sp.: *S. vulgaris* L. (lectotype).

About 30 spp., Temperate Eurasia.

Syringa is undoubtedly more closely related to *Ligustrum* than that genus is to some other Oleeae so that the distinction between Syringeae and Oleeae (at least in the present sense) is decidedly artificial and should be abandoned. The section *Sarcocarpion* is probably better placed in *Ligustrum* (q.v.). *Syringa* is noteworthy as the only genus of the Oleeae ever to have lobed or pinnatisect leaves (in 2 spp. only), perhaps a primitive character though the genus is rather advanced in some other respects.

11. Ligustrum *L.,* Sp. Pl. (1753) 7, Gen. Pl., ed. 5 (1754) 8; Knobl. in Engler et Prantl, Nat. Pflanzenfam. IV^2 (1895) 13: Mansfeld in Bot. Jahrb. LIX, Beibl. CXXXII (1924) 19-75. Incl.: *Parasyringa* W.W. Sm. in Trans. Bot. Soc. Edinb. XXVII (1916) 93. (Type sp.: *P. sempervirens* (Franch.) W.W. Sm.)

Type sp.: *L. vulgare* L.

About 40 spp. in Eurasia, Malaysia and trop. Australia.

The genus is closely related to *Syringa* (see Taylor, 1945) despite its succulent fruit. The section *Sarcocarpion* (Franch.) Mansf. (= *Parasyringa* W.W. Sm.) has a more or less dehiscent fruit and illustrates the close relationship. It seems unlikely that *Ligustrum* is as closely related to *Olea* as most authors have assumed.

12. Olea *L.*, Sp. Pl. (1753) 8, Gen. Pl., ed. 5 (1754); Knobl. in Engler et Prantl, Nat. Pflanzenfam. IV^2 (1895) 11 (excl. Sect. *Gymnelaea* et spec. plur. alias). Incl.: *Leuranthus* Knobl. in Notizbl. Bot. Gart. Berlin XII (1934) 177 (Type: *L. woodianus* (Knobl.) Knobl. = *Olea woodiana* Knobl.).

Type sp.: *O. europaea* L. (lectotype).

About 20 (?) spp. in Africa, S. Asia, E. Australia, Lord Howe Is. and New Caledonia.

The genus *Olea,* as interpreted by Knoblauch and indeed all authors from the time of Endlicher (1833), is a heterogeneous group, containing three elements, two of which are here excluded and treated as the distinct genera *Tetrapilus* Lour. and *Gymnelaea* (Endl.) Spach (see below). Thus restricted *Olea* appears to be a very natural group characterised by a short corolla with a very short tube and valvate lobes, an entire (usually helmet-shaped) or very shortly lobed stigma, paniculate terminal or axillary inflorescence, entire leaves, absence of any hairy indumentum and usually the presence of at least some degree of lepidote indumentum. This latter consists of the characteristic peltate trichomes found throughout the Oleaceae but these differ somewhat from those found in other genera (Knoblauch, 1895, p. 2; Metcalfe and Chalk, 1950). Whereas in most genera they appear as pits or dots in the epidermis, in *Olea* they appear as a sparse to dense indumentum of radiate scales, most strikingly developed in *Olea europaea* L. and *O. africana* Mill. but present, though often sparsely, in most species. Neither *Tetrapilus* nor *Gymnelaea* possesses this type of indumentum but both frequently possess normal hairs, chiefly on the inflorescence or young shoots. *Linociera,* which has also been confused with *Olea,* likewise is not lepidote, but frequently pubescent.

Most of the E. Asiatic species of *"Olea"* belong to *Tetrapilus* and the New Zealand and Norfolk Island species are, of course, *Gymnelaeae.* The Australian *O. paniculata* R. Br., however, is a true *Olea* as is *O. thozetii* Panch. et Seb. from New Caledonia (possibly not distinct from *O. paniculata*). Some Asiatic species (e.g., the Indian *O. glandulifera* Wall. ex G. Don) are likewise true *Oleae* but the chief home of the genus is the African continent.

Knoblauch (1932) reduces *Campanolea* Gilg & Schellenb. to *Olea,* but Verdoorn (1956) has shown that it should be placed under *Linociera* (see p. 417). The genus *Leuranthus* Knobl. was distinguished on the sole ground that the corolla-lobes are valvate but not induplicate. The only species, *L. woodianus,* is wholly *Olea*-like in facies and can scarcely be generically separated on this rather artificial character, which is not supported by any others.

13. Tetrapilus *Lour.*, Fl. Cochinch. (1790) 611. *Pachyderma* Bl., Bijdr. (1826) 682 (Type sp.: *P. javanicum* Bl.). *Stereoderma* Bl., Fl. Jav. Praefat. VII (1828) 9 (Type sp.: *S. javanicum* (Bl.) Bl.).

Type sp.: *T. brachiatus* Lour.

About 10-15 (?) spp. in S.E. Asia.

This genus has never been generally recognised and its species have mostly been described under *Olea.* Its claim to recognition as a distinct genus can be settled only by a comprehensive revision of the species. However, in facies the species of *Tetrapilus* as here defined differ considerably from *Olea* s. str. and in fact rather resemble some species of *Linociera.* Despite the comparatively well-developed corolla-tube it may yet be necessary to transfer these species to *Linociera.*

Tetrapilus may be distinguished from *Olea* by the usually longer corolla-tube, the (almost ?) always axillary panicles, complete lack of lepidote indumentum and frequent presence of some degree of hairy indumentum especially on the inflorescence, frequently toothed leaves and always more or less bilobed stigma. It is also frequently dioecious or polygamo-dioecious. From *Linociera* the distinction is rather less clear, lying chiefly in the longer corolla-tube and frequently toothed leaves. Nevertheless it seems undesirable to confuse the limits of *Linociera* at this stage by uniting *Tetrapilus* with it. As in *Linociera* the flowers of *Tetrapilus* are sometimes 5-merous.

The following list includes only those species of which I have examined specimens or which are clearly referable to *Tetrapilus* from the original descriptions. Doubtless some other species of *"Olea"* should also be transferred.

T. brachiatus Lour., Fl. Cochinch. (1790) 611. *Olea maritima* Wall. ex G. Don, Gen. Syst. IV (1838) 49; C. B. Clarke in Hook. f. et Thoms., Fl. Brit. Ind. III (1882) 612 (with further synonymy). *Tetrapilus axillaris* Rafin., Sylva Tellur. (1838) 138, *nom. illegit.* *Olea brachiata* (Lour.) Merr. in Lingnan Sci. Journ. V. (1927) 147; Trans. Amer. Phil. Soc. XXIV (1935) 307. ? *Pachyderma javanicum* Bl., Bijdr. (1826) 682. ? *Stereoderma javanicum* (Bl.) Bl., Fl. Jav. Praef. VII (1829) 9. ? *Olea javanica* (Bl.) Knobl. in Bot. Centralbl. LXI (1895) 134.

Indo-China, Malaya, W. Malaysia.

Koorders and Valeton (1902, pp. 247-256) consider that *Olea javanica* (Bl.) Knobl. is distinct from *O. maritima* Wall. ex G. Don (*Tetrapilus brachiatus* Lour.) and is in fact more closely related to *O. polygama* Wight (*Tetrapilus polygamus* (Wight) L. Johnson). They describe *O. graciliflora* Koord. et Valet. as a doubtful new species allied to *O. maritima*. I have seen only Malayan specimens and do not know whether Koorders and Valeton were correct regarding the Javan material. However this may be, the whole assemblage certainly belongs to *Tetrapilus,* not *Olea.*

T. dioicus (*Roxb.*) *L. Johnson,* comb. nov. *Olea dioica* Roxb., Fl. Ind. ed. Carey et Wall. I (1832) 105; Hort. Beng. (1814) 3, *nomen*; C. B. Clarke in Hook. f. et Thoms., Fl. Brit. Ind. III (1882) 612 (with further synonymy).

India.

T. dentatus (*Wall. ex. DC.*) *L. Johnson,* comb. nov. *Olea dentata* Wall. ex DC., Prodr. VIII (1844) 286; C. B. Clarke in Hook. f. et Thoms., Fl. Brit. Ind. III (1882) 613 (with further synonymy).

Burma.

From description.

T. polygamus (*Wight*) *L. Johnson,* comb. nov. *Olea polygama* Wight, Ic. IV (1850) tt. 1239, 1240; C. B. Clarke in Hook. f. et Thoms., Fl. Brit. Ind. III (1882) 613 (with further synonymy).

India, Ceylon.

From description and figures.

T. rubrovenius (*Elm.*) *L. Johnson,* comb. nov. *Linociera rubrovenia* Elm. in Leafl. Philipp. Bot. II (1909) 586, V (1913) 1652; Merr., Enum. Philipp. Pl. III (1923) 305.

Philippines.

T. oblanceolatus (*Craib*) *L. Johnson,* comb. nov. *Olea oblanceolata* Craib in Kew Bull. (1911) 410.

Siam.

From description.

ADDENDUM.

(Insert on page 409.)

Steganthus Knobl. Since this paper went to press I have seen Turrill's remarks (in Turrill, W. B. and Milne-Redhead, E.—Flora Trop. E. Africa. Oleaceae 1-31, London, 1952) on the type species, which he places in the genus *Olea* (as *O. welwitschii* (Knobl.) Gilg & Schellenb.), on the grounds that (i) the imbrication of the corolla segments is slight and inconstant and (ii) the species is very similar to *O. hochstetteri* Bak., a true *Olea*. From Turrill's description and figure this species does indeed appear to belong in *Olea* as defined in this paper. The genus *Steganthus* Knobl. should accordingly be reduced to synonymy under *Olea* L.

T. roseus (*Craib*) *L. Johnson*, comb. nov. *Olea rosea* Craib in Kew Bull. (1911) 411.

Siam and China (Yunnan).

From description.

T. penangianus (*Ridl.*) *L. Johnson*, comb. nov. *Olea penangiana* Ridl., Fl. Malay Peninsula II (1923) 318.

Malaya.

From description.

T. cordatulus (*Li*) *L. Johnson*, comb. nov. *Olea cordatula* Li in Journ. Arn. Arb. XXIV (1943) 372.

Indo-China.

From description.

T. hainanensis (*Li*) *L. Johnson*, comb. nov. *Olea hainanensis* Li in Journ. Arn. Arb. XXV (1944) 213.

Hainan.

From description.

T. laxiflorus (*Li*) *L. Johnson*, comb. nov. *Olea laxiflora* Li in Journ. Arn. Arb. XXV (1944) 314.

China: Yunnan.

From description.

T. densiflorus (*Li*) *L. Johnson*, comb. nov. *Olea densiflora* Li in Journ. Arn. Arb. XXV (1944) 314.

China: Yunnan.

From description.

A number of other species described under *Olea* may belong to *Tetrapilus* but I have seen no material and the descriptions are scarcely adequate to indicate their correct generic position. These include *Olea capitellata* Ridl. (said to have a fasciculate inflorescence, an unusual character for *Tetrapilus*), *O. puberula* Ridl. (said to have a terminal inflorescence, likewise decidedly unusual), *O. gamblei* C. B. Clarke (said to have both staminate and pistillate flowers apetalous, fairly certainly a *Tetrapilus* from the description), *Olea platycarpa* King et Gamble, *O. gagnepainii* Knobl. (*O. macrophylla* Gagnep. non Bak.), and perhaps *O. yuennanensis* Hand.-Maz. On the other hand *O. neriifolia* Li, from Hainan, may well be a true *Olea*. *Linociera philippinensis* Merr. rather resembles *Tetrapilus*, illustrating the close approach between the two genera and the necessity for a monographic revision of *Linociera*.

14. Steganthus *Knobl.* in Notizbl. Bot. Gart. Berlin XI (1934) 116.

TYPE SP.: *S. welwitschii* (Knobl.) Knobl. (*Mayepea welwitschii* Knobl.).

2 (?) spp. in Tropical Africa.

Knoblauch relates this genus to *Olea*, distinguishing it by the imbricate, not valvate-induplicate, aestivation. The two species from Central Africa, of which I have seen no material, would appear to be closer to *Linociera* than *Olea*, but Knoblauch's third species *S. lanceus* (Lam.) Knobl. from the Mascarenes is surely a true *Olea* (*O. lancea* Lam.). It has the facies of an *Olea* and I can detect no essential difference from that genus in the corolla. *Steganthus* may be a good genus, but *O. lancea* should surely not be included in it. Perrier de la Bâthie (1950) retains *O. lancea* in *Olea*, without comment.

*__15. Linociera__ *Sw.* in Schreber, Gen. II (1791) 784, Fl. Ind. Occ. I. (1797) 49, t.2, *nom. conserv.;* Knobl. in Bot. Centralbl. LXI (1894). *Mayepea* Aubl., Pl. Guian. I. (1775) 81, t.31; Knobl. in Engler et Prantl, Nat. Pflanzenfam. IV^2 (1895) 10 (Type sp.: *M. guianensis* Aubl.).

Type sp.: *L. ligustrina* (Sw.) Sw.

Perhaps 80-100 spp. in the tropics and subtropics of America, Africa, Asia and Australia.

A comparatively large and diversified tropical genus much in need of revision. From its distribution it is probably an old genus but morphologically it scarcely seems to be primitive in the Oleoideae. Unfortunately no chromosome count has been made on this largest genus of the subfamily. However, *Chionanthus,* which appears to be a closely related temperate counterpart of *Linociera,* has the characteristic haploid number of 23.

As mentioned above *Tetrapilus* appears to be more closely related to *Linociera* than to *Olea.* Likewise *Steganthus* should be considered in relation to *Linociera.*

There seems little difficulty in distinguishing *Linociera* from *Olea* in the strict sense though some African species have been confused (e.g., *Linociera foveolata* (E. Mey.) Knobl. (1936), which has generally been treated as a species of *Olea* although it has the flowers, indumentum and facies of a *Linociera*). The Lord Howe Island species *L. quadristaminea* (F. Muell.) Knobl. is rather atypical but fits much better in *Linociera* than in *Notelaea* where it was placed, without explanation, by Hemsley (1896).

16. Chionanthus *L.,* Sp. Pl. (1753) 8 (excl. sp. 2), Gen. Pl., ed. 5 (1754) 9; Knobl. in Engler et Prantl, Nat. Pflanzenfam. IV^2 (1895) 11.

Type sp.: *C. virginicus* L.

2 spp. in China and eastern N. America.

Chionanthus appears to be a temperate specialised derivative of *Linociera.* It has an interesting disjunct present-day distribution characteristic of a number of genera (e.g. *Liriodendron*).

17. Haenianthus Griseb. in Mem. Amer. Acad., n. s., VIII (1863) 518, Fl. Brit. W. Ind. Isl. (1864) 405; Urb. in Bot. Jahrb. XV (1892) 340; Knobl. in Engler et Prantl, Nat. Pflanzenfam. IV^2 (1895) 16, in Rep. Spec. Nov. XXXIV (1933) 139.

Type sp.: *H. incrassatus* Griseb.

About 3 spp. in W. Indies.

18. Tessarandra *Miers* in Ann. Mag. Nat. Hist., ser. 2., VII (1851) 179; Miers ex Lindl., Veg. Kingd. (1847) 617, *nomen;* Knobl. in Engler et Prantl, Nat. Pflanzenfam. IV^2 (1895) 11.

Type sp.: *T. fluminensis* Miers.

1 sp. in Brazil.

*__19. Dekindtia__ *Gilg* in Bot. Jahrb. XXXII (1902) 139.

Type sp.: *D. africana* Gilg.

1 sp. in Trop. Africa.

20. Noronhia *Stadtm.* in Thouars, Gen. Nov. Madagasc. (1806) 8; Knobl. in Engler et Prantl, Nat. Pflanzenfam. IV^2 (1895) 11; H. Perrier in Mém. Inst. Sci. Madagascar, Sér. B, II (1950) 281.

Type sp.: *N. emarginata* Thou.

About 40 spp. in Madagascar and the Comores

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* *Dekindtia* and *Campanolea* Gilg et Schellenb. are referable to *Linociera* (see Addendum, p. 416).

Formerly (Knoblauch, 1895) thought to consist of a single species in Madagascar and Timor, this genus proves to have numerous species in Madagascar (Perrier de la Bâthie, 1950). The Timor record is evidently based on some confusion. Perrier relates *Noronhia* to *Linociera* but its exact position within the Oleeae is a little obscure. The flowers are rather distinctive. See also under *Comoranthus,* above.

21. Notelaea *Vent.,* Choix Pl. (1803) 25, t. 25. (excl. *N. ligustrina* Vent.); Knobl. in Engler et Prantl, Nat. Pflanzenfam. IV^2 (1895) 10 (excl. sect. *Picconia* (DC.) Knobl. and *N. ligustrina* Vent.).

Type sp.: *N. longifolia* Vent.

7 spp. in E. Australia.

The geographically widely separated and rather dissimilar Macaronesian genus *Picconia* (see below) has generally been included in *Notelaea* but has little to do with it. *Notelaea* has also been confused with *Linociera* (*L. quadristaminea*) and with *Gymnelaea* (see below). As here defined it is a very natural group, uniform in floral structure and general morphology.

From the descriptions *N. ? cymosa* Guillaum. and *N. ? paniculata* Guillaum. cannot belong to *Notelaea* or *Gymnelaea.* They are of obscure position but may be related to *Linociera. N. brachystachys* Schlechter and *N. francii* Guillaum. likewise do not appear to belong to either *Notelaea* or *Gymnelaea.* The large fruits of these species, taken by Guillaumin (1942) as a characteristic of *Notelaea* in contrast to *"Osmanthus"* (*Gymnelaea*), are not found in the true *Notelaea* of Eastern Australia. There is a resemblance, however, to *Linociera quadristaminea* of Lord Howe Island.

Unfortunately I have seen material of only one of the above four species, namely *N. brachystachys.* These New Caledonian species require further investigation; possibly they belong to *Linociera* or even to an undescribed genus.

22. Gymnelaea (*Endl.*) *Spach,* Hist. Nat. Vég. Phanér. VIII (1839) 258. *Olea* sect. *Gymnelaea* Endl., Prodr. Fl. Norfolk. (1833) 56, Gen. Pl. (1838) 572; Knobl. in Engler et Prantl, Nat. Pflanzenfam. IV^2 (1895) 11; Cheeseman, Man. N.Z. Fl., ed. 2. (1925) 718.

Type sp.: *Gymnelaea apetala* (Vahl) L. Johnson (*Olea apetala* Vahl). Endlicher originally based the section on Norfolk Island material which he referred with some doubt to *O. apetala* Vahl, which had been described from New Zealand material. Since Endlicher did not exclude his plant from *O. apetala* Vahl it seems that that species must be the type of *Olea* sect. *Gymnelaea* Endl. and consequently of *Gymnelaea* (Endl.) Spach. No binomials have hitherto been published under *Gymnelaea.*

About 12 spp. chiefly in New Zealand and New Caledonia but also in Hawaii, Norfolk Island and S.E. Australia.

This genus, apart from its publication by Spach, has never been accepted. As here interpreted it includes not only the apetalous New Zealand and Norfolk Island species referred by Endlicher, Bentham and Hooker (1876), Knoblauch (1895), Cheeseman (1925) and others to *Olea* sect. *Gymnelaea* but also the Australian *Notelaea ligustrina* Vent., the New Caledonian species referred to *Notelaea* by Schlechter (1906) and to *Osmanthus* by Knoblauch (1936) and Guillaumin (1942, 1948), and *Osmanthus sandwicensis* (A. Gray) Knobl. (*Olea sandwicencis* A. Gray).

The name *Gymnelaea* is not particularly appropriate, since only the New Zealand-Norfolk Island species are apetalous, and these may be regarded as reduced in this respect. *Gymnelaea* bears little resemblance to *Olea* and there seems no reason, other than tradition, for associating the apetalous species with that genus. Rather, the relationship appears to be with the *Osmanthus* group. *Gymnelaea* is distinguished from other Oleeae by the following combination of characters: (i) Corolla-lobes imbricate in bud (or flowers apetalous), (ii) inflorescence a simple raceme (sometimes 2 or more racemes in each axil), (iii) bracts (except basal bracts) small and slender, (iv) leaves evergreen, entire. It is distinguished from *Linociera* by (i) and (ii); from *Olea* by (i), (ii), the bifid stigma and the absence of lepidote indumentum and frequent presence of hairy indumentum; from *Notelaea* by (i) and in general by the rather obscure venation; from *Osmanthus* by (ii) and by the always entire leaves; from *Amarolea* by (ii) and (iii). Furthermore most species of *Gymnelaea* frequently have microcrystalline deposits (excretions) on the foliage. These are not found in any of the above genera which otherwise bear some resemblance to it, except rarely in *Notelaea microcarpa* R. Br., but occur in *Phillyrea* and *Picconia*, which differ in other respects (see Key II) and are, moreover, geographically remote.

The apetalous group could, of course, be readily separated from the remainder, with which in fact they have not hitherto been associated, but such a separation appears to be artificial. The general resemblance between the New Zealand species and the New Caledonian species, for example, is quite striking.

The following diagnosis defines *Gymnelaea* as here understood:

Flores hermaphroditi vel dioici; calyx ± profunde 4-fidus; corolla ± gamopetala vel 0, tubo perbrevi vel modice elongato, lobis 4 ovatis orbicularisve aestivatione imbricata; stamina 2 (rare 4) filamentis corollae adnatis vel (in speciebus apetalis) hypogyna; ovarium biloculare stylo brevi stigmate ± bifido. Fructus drupaceus. Arbores vel frutices alti, ramulis glabris vel rare pubescentibus, foliis simplicibus integris glabris vel rare pubescentibus ± obscure venosis vel eveniis vel venis impressis haud prominentibus necnon valde reticulatis. Inflorescentiae racemoso-cymosae (simplices), glabrae vel pubescentiae, bracteis parvis, tenuibus.

The following species are referable to *Gymnelaea*:

G. apetala (*Vahl*) *L. Johnson,* comb. nov. *Olea apetala* Vahl, Symb. Bot. III (1794) 3; Endl., Prodr. Fl. Norfolk. (1833) 56; Cheesem., Man. N.Z. Fl., ed. 2 (1925) 718. *O. endlicheri* F. Muell, in Journ. Bot. XXIII (1885) 354, nota.

N. Zealand (North Island) and Norfolk Is.

Specimens Examined: *New Zealand*: Taranga Islands (Hen & Chickens), Cheeseman. *Norfolk Is.*: Robinson 153 (NSW 33352), xi. 1898; Robinson 232, 1902 (NSW 33353); Maiden and Boorman (NSW 33354), xi. 1902; Maiden and Boorman (NSW 33355), xi. 1902; Metcalfe (NSW 33356); Metcalfe (NSW 33357).

A dioecious, apetalous species. None of the specimens seen shows the microcrystalline deposits found in most species of the genus.

G. cunninghamii (*Hook. f.*) *L. Johnson,* comb. nov. *Olea cunninghamii* Hook. f., Fl. Nov. Zel. I (1853) 175; Cheesem., Man. N.Z. Fl. ed. 2 (1925) 718.

N. Zealand (North Island).

Specimen examined: Cape Palliser, Kirk.

An apetalous species but strongly similar in general aspect to some New Caledonian species with well-developed corolla (e.g. *G. badula*). Microcrystalline deposits evident. The pubescent racemes and young branchlets are noteworthy (very unlike *Olea* s. str.).

G. lanceolata (*Hook. f.*) *L. Johnson,* comb. nov. *Olea lanceolata* Hook. f., Fl. Nov. Zel. I (1853) 176; Cheesem., Man. N.Z. Fl., ed. 2 (1925) 719, Ill. N.Z. Fl. II (1914) t.134.

N. Zealand (North Island).

Closely related to *G. cunninghamii.* Cheeseman's figure cited above is a good illustration of a characteristic apetalous *Gymnelaea.* The presence of four stamens in some flowers is noteworthy; this feature occurs sporadically in a number of genera of the Oleaceae.

G. montana (*Hook. f.*) *L. Johnson,* comb. nov. *Olea montana* Hook. f., Fl. Nov. Zel. I (1853) 176, t.46A & B; Cheesem., Man. N.Z. Fl. ed. 2 (1925) 719.

N. Zealand (North Island).

SPECIMEN EXAMINED: Pitirangi Ranges.

A very slender species. Microcrystalline deposit evident.

G. badula (*Vieill. ex Panch. et Seb.*) *L. Johnson,* comb. nov. *Notelaea badula* Vieill. ex Panch. et Seb. in Seb., Not. Bois. Nouv. Caléd. (1874) 184. *Osmanthus badula* (Vieill. ex Panch. et Seb.) Hutchins. ex S. Moore in Journ. Linn. Soc., Bot. XLV (1921) 356.

New Caledonia.

SPECIMENS EXAMINED: Auf den Bergen am Ngoye, Schlechter 15166, 31.xi.1902; Prony, Franc 114, iii. 1924; Couvelée, Franc 2405, 1.xi.1929; Baie du Sud, Le Boucher 1508, 1903; N. Caledonia, Compton 2049.

A species with a well-developed corolla, the tube about as long as the lobes. Microcrystalline deposits often present. Pancher and Sebert (in Sebert, 1874) remarked "Cette espèce paraît bien voisine de *notelaea ligustrina* de Ventenat, originaire de l'État de Victoria (Nouvelle Hollande).", which is very true but has been overlooked by subsequent authors.

G. collina (*Schlechter*) *L. Johnson,* comb. nov. *Notelaea collina* Schlechter in Bot. Jahrb. XXXIX (1906) 229. *Osmanthus collinus* (Schlechter) Knobl. in Rep. Spec. Nov. XLI (1936) 152.

New Caledonia.

SPECIMENS EXAMINED: Auf den Huegeln bei Paita, Schlechter 14834, 28.ix.1902 (ISOTYPE); Val Luizon, Franc 2480, 30.viii.1930.

Microcrystalline deposit prominent.

G. monticola (*Schlechter*) *L. Johnson,* comb. nov. *Notelaea monticola* Schlechter in Bot. Jahrb. XXXIX (1906) 229. *Osmanthus monticola* (Schlechter) Knobl. in Rep. Spec. Nov. XLI (1936) 152.

New Caledonia.

G. eucleoides (*Schlechter*) *L. Johnson,* comb. nov. *Notelaea eucleoides* Schlechter in Bot. Jahrb. XXXIX (1906) 229. *Osmanthus eucleoides* (Schlechter) Knobl. in Rep. Spec. Nov. XLI (1936) 152.

New Caledonia.

SPECIMEN EXAMINED: Auf den Bergen am Ngoye, Schlechter 15164, 31.xi.1902 (ISOTYPE).

G. vaccinioides (*Schlechter*) *L. Johnson,* comb. nov. *Notelaea vaccinioides* Schlechter in Bot. Jahrb. XXXIX (1906) 230. *Osmanthus vaccinioides* (Schlechter) Hochr. in Bull. New York Bot. Gard. VI (1910) 284.

New Caledonia.

SPECIMENS EXAMINED: Auf den Bergen bei Paita, Schlechter 14976, 9.x.1902 (ISOTYPE); Nekando, Compton 2128.

Very similar to *G. eucleoides.*

G. sandwicensis (*A. Gray*) *L. Johnson,* comb. nov. *Olea sandwicensis* A. Gray in Proc. Am. Acad. V (1862) 331. *Osmanthus sandwicensis* (A. Gray) Benth. et Hook. f. ex Hook. f. et Jackson, Index Kewensis I (1894) 380; Knobl. in Bot. Centralbl. LXI (1895) 82.

Hawaii.

Specimens examined: Kauai: Halemanu, Rock 1576, ii.1909; Halemanu, Rock 1574, 14.ii.1909. Oahu: Mt. Kaala, Degener, Murashige and Kerr 19739, 10.vii.1949; Makapa Valley, Kuola Range, Forbes, 19.xii.1909. Maui: Haleakala, Alexander and Kellogg 5354, 20.v.1948.

This has the inflorescence and aspect of *Gymnelaea* rather than *Osmanthus* s. str. Microcrystalline deposits often present.

G. ligustrina (*Vent.*) *L. Johnson,* comb. nov. *Notelaea ligustrina* Vent., Choix Pl. (1803) 25; Benth., Fl. Austral. IV (1868) 300.

S.E. Australia (South-eastern N.S. Wales, Victoria and Tasmania).

This species will be discussed in a separate paper.

Notelaea brachystachys Schlechter (in Bot. Jahrb. XXXIX (1906) 228) (*Osmanthus brachystachys* (Schlechter) Knobl., 1936) has valvate-induplicate corolla-lobes and does not appear to belong to *Gymnelaea.* On the other hand it has not the foliage or general aspect of a true *Notelaea.* The inflorescence is racemose as in both these genera but it lacks the rather prominent basal bracts. Its true position is rather obscure. The leaves resemble those of some species of *Linociera,* to which it may be related.

23. Amarolea *Small,* Man. Southeast Fl. (1933) 1043, 1507.

Type sp.: *A. americana* (L.) Small (*Olea americana* L.).

2-3 spp. in eastern N. America.

Although clearly related to *Osmanthus* this small American group seems to be quite as distinct as *Siphonosmanthus, Phillyrea* or *Gymnelaea* and its exclusion leaves *Osmanthus* as a more coherent genus. It is perhaps unfortunate that its original segregation by a notorious "splitter" may have prejudiced conservative American botanists against its adoption. Its elongated racemose (often one-branched) inflorescence, prominent thick bracts, short thick pedicels and longer corolla-tube distinguish it from the east-Asiatic *Osmanthus.* These or other characters distinguish it from the remainder of the group (see Key II). Taylor (1945) records *A. americana*—as *Osmanthus americanus* (sphalm. "*americana*")—as a hexaploid ($2n = 138$). As he remarks, this in itself does not warrant generic segregation but may possibly be significant in conjunction with the well-marked morphological differences and geographic separation from *Osmanthus.*

24. Osmanthus *Lour.,* Fl. Cochinch. (1790) 28; Knobl. in Engler et Prantl, Nat. Pflanzenfam. IV^2 (1895) 9 (excl. spec. plur.).

Type sp.: *O. fragrans* Lour.

About 15 spp. in E. and S.E. Asia.

The concept of *Osmanthus,* like *Olea* and *Notelaea,* has been "stretched" over the years to include such heterogeneous elements that its limits (s. lat.) became increasingly arbitrary. In the broadest sense it included *Osmanthus* s. str., *Siphonosmanthus, Amarolea,* part of *Gymnelaea* and even part of *Steganthus,* yet strangely it was kept distinct from *Phillyrea,* more similar than some of these to *Osmanthus* s. str. So much for the power of tradition where a European and therefore well-known genus is concerned.

As here delimited *Osmanthus* is a very coherent group morphologically and geographically. The distinctions from the related or supposedly related genera will be found in Key II or under those genera.

25. Siphonosmanthus *Stapf* in Bot. Mag. CLIII (1929) sub t. 9176.

TYPE SP.: *S. suavis* (C. B. Clarke) Stapf (*Osmanthus suavis* C. B. Clarke).

3 spp. in India and China.

Closely related to *Osmanthus* and *Phillyrea*. An intergeneric hybrid with the latter is cultivated and has been described as × *Osmarea* Burkwood & Skipwith (see Rehder, 1949).

26. Phillyrea *L.*, Sp. Pl. (1753) 7, Gen. Pl., ed. 5 (1754) 8; Knobl. in Engler et Prantl, Nat. Pflanzenfam. IV^2 (1895) 9.

TYPE SP.: *P. latifolia* L. (LECTOTYPE).

About 4 spp. in the Mediterranean Region and W. Asia.

Closely related to *Siphonosmanthus* and *Osmanthus* and also to *Picconia* (see those genera for discussion). *Phillyrea* was treated as a section of *Olea* by Endlicher (1838) but is not closely related to that genus.

27. Picconia *DC.*, Prodr. VIII (1844) 288; Knobl. in Notizbl. Bot. Gart. Berlin XI (1934) 1028. *Notelaea* sect. *Picconia* Knobl. in Engler et Prantl, Nat. Pflanzenfam. IV^2 (1895) 10.

TYPE SP.: *P. excelsa* (Ait.) DC. (*Olea excelsa* Ait.).

2 spp. in the Canary Islands, Madeira and the Azores.

Although customarily referred to *Notelaea* or its neighbourhood, I consider *Picconia* to be most closely related to *Phillyrea*. It resembles that genus in leaf venation and texture, racemose inflorescence (though more robust and elongated in *Picconia*), shape and texture of basal bracts, shape of stigma, and presence of microcrystalline "bloom" on the petioles, etc. Moreover, the large, pale-green or whitish, concave, more or less connate, ciliate, deciduous bracts of *Picconia* are really quite similar (though much larger) to those of *Phillyrea*. The corolla of *Picconia* is usually described as valvate-induplicate. Unfortunately I have not seen unopened buds, but the appearance of opened flowers suggests that this may be erroneous, so *Picconia* is included in both divisions of the key above. In any case the flowers suggest *Phillyrea* flowers with the tube even further reduced and the lobes greatly elongated, the stamens being more or less enclosed. On the other hand there is little resemblance to *Notelaea* except in the rather artificial "key characters" so much stressed by Knoblauch. Phytogeographically a relationship with *Phillyrea* is very much more probable than with the eastern Australian *Notelaea*. The discontinuous distribution, Macaronesia—E. Australia, would be unique, indeed.

28. Forestiera *Poir.*, Encycl. Suppl. I (1810) 132, II (1811) 664; Knobl. in Engler et Prantl, Nat. Pflanzenfam. IV^2 (1895) 9. *Adelia* P. Br., Hist. Jam. (1756) 361, t. 36, fig. 3 (type sp. *A. acuminata* Michx.) *non Adelia* L. (1759) *nom. conserv.* (Euphorbiaceae).

TYPE SP.: *F. acuminata* (Michx.) Poir. (*Adelia acuminata* Michx.).

About 15 spp., chiefly in southern U.S.A. and Mexico, but also in W. Indies and S. America.

A rather isolated genus in the Oleeae. Taylor (1945) compares it with *Ligustrum* and *Fraxinus* but the differences from these diverse genera are more striking than the resemblances, which are secondary. *Forestiera* probably has some general relationship with the *"Osmanthus* group" but with its apetalous flowers, short slender inflorescences and often deciduous, sometimes alternate leaves, stands well apart from the other genera. In some respects it resembles *Phillyrea* (small often toothed leaves, short slender inflorescence, small fruit) doubtless due to convergence.

29. Hesperelaea *A. Gray* in Proc. Am. Acad. XI (1876) 83; Knobl. in Engler et Prantl, Nat. Pflanzenfam. IV² (1895) 9.

TYPE SP.: *H. palmeri* A. Gray.

1 sp. in Mexico (Guadalupe Is., Baja California).

An apparently isolated genus of uncertain affinity. I have seen no material.

CONCLUSION.

In the present state of our knowledge the detailed phylogeny of the Oleaceae must be a matter of largely baseless speculation, except in so far as the unity of the Subfamily Oleoideae and its probably allotetraploid origin are concerned (Taylor, 1945). I can see little reason for the particular arrangement of the genera of Oleoideae in the diagram given by Taylor (1945, p. 362), which in any case is certainly over-simplified by the omission of most of the tropical and southern genera. Nevertheless, Taylor's rearrangement of the family at the tribal level is of great value and his work generally renders previous classifications obsolete.

Before much further progress can be made in the general taxonomy of the family certain detailed revisions will be necessary, notably of *Linociera* and its allies. Equally, if not more, desirable is an extension of cytotaxonomic studies to the tropical genera, in this case especially to *Schrebera, Comoranthus* and *Myxopyrum*. Comparative anatomical and morphological studies are quite essential if the phylogeny is to be elucidated. Pollen studies so far do not seem to have shown much promise in this family (Erdtman, 1952).

The present study has admittedly been rather cursory; its purpose will have been fulfilled if, as I believe, it has to some extent clarified the status and delimitation of such confused genera of the Oleoideae as *Olea, Osmanthus, Amarolea, Gymnelaea, Notelaea, Picconia* and (more doubtfully in relation to *Linociera*) *Tetrapilus*. In tentatively rearranging the genera and tribes, especially of Jasminoideae, I hope to have eliminated a few anomalies, possibly to introduce new ones in the process but at least to draw attention to similarities and differences in this heterogeneous group. The two subfamilies of Oleaceae are scarcely of equal status: Jasminoideae is merely a convenient and capacious pigeonhole for everything that is excluded from the Oleoideae. Ultimately it may be desirable to abandon the Subfamilies and to treat the allotetraploid Oleoideae as equivalent to the other tribes. At present the status of the latter is too uncertain for this course to be wise.

ACKNOWLEDGMENTS.

I wish to express my thanks to my colleagues on the staff of the National Herbarium of New South Wales for testing (successfully) the rather involved keys with material of all the genera except *Abeliophyllum, Comoranthus, Steganthus, Tessarandra, Dekindtia, Haenianthus, Noronhia* and *Hesperelaea,* of which suitable material was not available.

ADDENDUM.

Since this paper went to press I have seen Verdoorn's (1956) excellent revision of the Oleaceae of southern Africa. Verdoorn has thrown new light on the obscure monotypic "genera" *Campanolea* Gilg et Schellenb. (referred by Knoblauch (1932) to *Olea*) and *Dekindtia* Gilg. He concludes that both of these should be referred to the synonymy of *Linociera,* as the latter genus is currently understood.

From the descriptions and comments given by Verdoorn his conclusion seems reasonable and the key and enumeration in the present paper should be emended accordingly. The following should be added to the synonymy of *Linociera* on p. 410:

Dekindtia Gilg in Bot. Jahrb. XXXII (1902) 139 (Type: *D. africana* Gilg = *Linociera battiscombei* Hutch.). *Campanolea* Gilg et Schellenb. in Bot. Jahrb. LI (1913) 73 (Type: *C. mildbraedii* Gilg et. Schellenb. = *Linociera latipetala* M. R. F. Taylor).

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ERRATA

Page 8, line 47, for "B aidwood" read "Braidwood".
,, 74, ,, 24, omit parantheses around the word '*Domin.*'
,, 87, ,, 40, for '*Agropryon*' read '*Agropyron*'.
,, 250, ,, 3, for 'of which' read 'which is'.
Plate VII, caption, line 2, for '*obtusta*' read '*obtusata*'.
Page 331, line 43, for '328' read '329'.
,, 338, ,, 31, for '*Gyathea*' read '*Cyathea*'.
,, 395, ,, 6, for 'tribues' read 'tribes'.
,, 396, last line, for 'Fortaneseae' read 'Fontaneseae'.

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